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Double Exponentially Weighted Moving Average Control Chart for the Individual Based on a Linear Prediction

Rafael Alberto Perez Abreu Carrion

UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

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A DOUBLE EXPONENTIALLY WEIGHTED MOVING AVERAGE CONTROL CHART FOR THE INDIVIDUALS BASED ON A LINEAR PREDICTION

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Rafael Alberto Pérez Abreu Carrión

College of Education and Behavioral Sciences
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Accepted by the Doctoral Committee

_____
Jay Schaffer, Ph.D., Research Advisor

_____
Trent Lalonde, Ph.D., Committee Member

_____
Khalil Shafie Holighi, Ph.D., Committee Member

_____
Heng-Yu Ku, Ph.D., Faculty Representative

Date of Dissertation Defense _____

Accepted by the Graduate School

_____
Linda L. Black, Ed.D.
Associate Provost and Dean
Graduate School and International Admissions

ABSTRACT

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Industrial process quality control frequently uses the Exponentially Weighted Moving Average control chart (EWMA CC) and the double EWMA CC (DEWMA CC) to detect small shifts in a process when the sample size $n = 1$. The EWMA CC was initially developed and evaluated in 1959. In 2005, the EWMA technique was extended to the DEWMA. Continued research into DEWMA has developed and assessed several alternatives, including multivariate control charts. These studies focus on detecting small shifts in process. In practice, however, we occasionally wish to detect small trends instead of shifts in the process. The effectiveness of these methods to determine small trends in a process has not been thoroughly researched in the current literature. This research proposes a new control chart, based on the fundamental theorem of exponential smoothing prediction, first presented by Brown and Meyer in 1961. The new chart is called "The Double Exponentially Weighted Moving Average Based on a Linear Prediction" (DEWMABLP) control chart. This study presents a simulation to contrast the efficiency of DEWMABLP, EWMA, DEWMA, and classical Shewhart control charts when small trends are introduced. A conclusion is the DEWMABLP control chart can be used to monitoring small shifts. Also, results suggest that the new control chart is more efficient than the other control charts not only for small drifts, but also for small shifts.

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CHAPTER I

INTRODUCTION

Control charts have been widely used to ensure and improve the quality of products and services at companies and in industries. In the 1920s, while working for Bell Telephone Laboratories, Shewhart (1926) developed control charts to identify when a process was producing a good or a defective product. Control charts were used during World War II to ensure the quality of products including the manufacture of weapons--Montgomery (2007). The American Society for Quality Control was formed in 1946 after World War II; these statistical techniques and other methodologies were developed extensively and used in many countries including the countries involved in this conflict. One of the most significant examples of these countries developing quality goods was Japan in 1960. Under the advice of several American statisticians, Japanese industry became known for its quality and productivity in the following years. Deming (1981), the most well-known consultant who visited Japan frequently, gave lectures and trained many Japanese engineers and scientists between 1950 and 1980.

From 1970 to 1990, the increase in quality and productivity in Japanese industry became an important quality development (Juran & Riley, 1999). As a result, Kolb and Hoover (2012) state that between 1970 and 1980, Japan was able to produce higher-quality devices at lower prices, benefiting consumers throughout the world (Kolb & Hoover, 2012). Deming (1986) registered many of his experiences as a statistical

consultant to Japanese engineers. The control charts were always a topic to present in training (Deming, 1986). In that time, Ishikawa (1985), who was influenced by a series of lectures Deming had given to Japanese engineers and scientists, wrote *What is Total Quality Control? The Japanese Way.* In his work, Ishikawa explains the way Japanese industry had taken the lead in quality matters. Seven tools for quality control were introduced in this manuscript. Obviously, one of these seven tools was the control chart. Although there are several versions of the basic seven tools for quality control, quality book authors generally present the same tools, changing the stratification tool to a flow chart or run chart (Tague, 2004). The American Society for Quality currently presents the following seven basics quality tools in its web page: (a) Cause-and-effect diagram, also known as the "fishbone" or Ishikawa diagram; (b) check sheet; (c) control chart; (d) histogram; (e) Pareto chart; f) scatter diagram; and (g) stratification.

Around 1970, with the increase in good quality electronic devices and home appliance items produced in Japan, American industry and its scientists wondered how Japanese industry was making better devices (Kolb, 2012). Several American enterprises sent their directors and scientists to visit Japan in an attempt to discover the secret to success in the Japanese quality industries (PP&S, Inc. Headquarters, 2013). American directors and scientists found that the Japanese industry was focused on the continual improvement of its process and products, based on a series of scientific statistical methods with their own Japanese cultural emphasis (González, 1990). In an effort to compete against Japanese industry, several American industry initiatives were launched, such as, the "zero defects" program and "do it right the first time" by Philip Crosby. Crosby published *Quality Without Tears* in 1984 and *Quality is Free* in 1980. However,

these important quality developments had a more motivational component than scientific methodology. The American industry adopted again using the scientific method to produce goods and services, as Kolb (2012) and Walton (1988) declared: “In 1980, thirty years after he first taught the Japanese his methods, Deming was ‘rediscovered’ in America. ‘If Japan Can... Why Can’t We?’, a NBC-TV special report broadcasted in June 1980” (Dobyns & Frank, 1980, p.17).

Based on this premise, the Six Sigma initiative was launched in 1986 by Bill Smith, while he worked at Motorola. Montgomery and Woodall (2008) give a historical perspective of Six Sigma. Jack Welch adopted it as the core of his business strategy at General Electric in 1995 (Eckes, 2002; Kolb, 2012; PP&S, Inc. Headquarters, 2013). A list of these initiatives is given in (PP&S, Inc. Headquarters, 2013). Six Sigma methodology is still used in many industrial sectors around the world (Eckes, 2002). Six Sigma is a series of statistical and non-statistical tools that aim to improve the quality of products and processes. Six Sigma tries to identify and remove the causes of defects, and minimize the variability in manufacture and business processes (Kolb, 2012). At the beginning, the Six Sigma program seemed to be an American cultural adaptation program, based on the quality Japanese philosophy program, to create good quality products in America (PP&S, Inc. Headquarters, 2013). The control chart tool still remains as an important tool to develop quality inside the Six Sigma philosophy (Eckes, 2002; Pyzdek, 2003).

Purpose of the Control Charts

The idea behind the control chart tool is to identify when a variation in a process or product is due to an assignable cause, or when it is due to a by-chance cause. This

discriminatory process is performed by the examination of a random sample of size n, taken at intervals of time equally spaced from production. The assignable cause refers to when a special event alters the processes, while a by-chance cause refers to when the natural variation of the process is present. Currently, control charts are still broadly used in manufacturing and service companies around the world, as a tool to guarantee the increase in quality of goods and services (Eckes, 2002; Pyzdek, 2003). The control charts also help to identify when the process needs to be adjusted, as soon as the production deviates from the target or goal.

Typically, a control chart is a graph versus the time that consists of four components: (a) A central line (CL) as the target of the production; (b) an upper control line (UCL); (c) a lower control line (LCL); and (d) a points series that represents the value of the variable of interest at each time. When the process is in-control, the plot point should be between the UCL and LCL, otherwise the process is out-of-control and the process needs to be adjusted.

Many control charts have been developed with several different objectives. Some control charts focus on detecting big changes in the mean level of the variable of interest, as the classical X-bar Shewhart control chart does, while others have been developed to detect small shifts, such as the Exponentially Weighted Moving Average (EWMA) and the Double Exponentially Weighted Moving Average (DEWMA) control charts. Roberts (1959) first introduced the EWMA control chart, and Shamma and Shamma (1992) the Double Exponentially Weighted Moving Average (DEWMA) control charts. Montgomery (2007) shows that some of these charts focus on detecting a shift at the average level, while others deal with the detection of a change in variation, like control

charts for range, standard deviation, and variance. In the same way, a control chart for attributes to control the percentage of nonconforming items or defects has been developed, as well as a control chart for nonconformities; that is, defects by unit of production.

Equally important are the multivariate techniques that have been proposed to monitor two or more variables at once; the so-called multivariate control chart. The first work in multivariate quality control charts was done by Hotelling in 1947, who applied his procedures to bombsite data during WWII (Montgomery 2007). The T^2-Hotelling control chart is a natural extension of the univariate control chart of Shewhart. In the same manner, Lowry, Woodall, Champ, and Rigdon (1992) extended the univariate EWMA control chart to a multivariate EWMA control chart. More information about multivariate control charts can be read in Lowry and Montgomery (1995).

Statement of the Problem

Most control charts are designed to detect a shift or change in the process. In practice, however, sometimes it is desirable to detect a small trend or drift in the process instead of a shift; that is, a small linear departure from the objective value of the variable of interest. The effectiveness of these methods, to determine small trends in a process, has not been researched thoroughly in the current literature. A few studies have evaluated the traditional control charts under linear drift. For instance, Knoth (2012) summarized few papers in industrial practice where a gradual change occurs due to tool wear or other causes. Knoth discussed a small list of papers on control charts for detecting out-of-control of the mean under linear drift. The author concludes that at the current level of knowledge, the classic control charts could be used for drift detection, and claims that

"generally speaking, the schemes specifically designed for detecting drifts (instead of a step change) are not really worth the effort," and, in conclusion says "statistical drift monitoring is just at its beginning" (Knoth, 2012, p. 66). These results led to Knoth to invite the statistical process control (SPC) community to do more, in order to enhance the knowledge about drift detection.

Rationale for the Study

The traditional goal in SPC is to detect occurrences of assignable causes of process "shift" quickly, such that investigation of the process and corrective action may be undertaken before many nonconforming units are manufactured. In this regard, a few studies deal with the less common form in industrial practice: slow change "drift" due to tool wear or similar causes. As has been mentioned, there is a brief list of currently available literature that deals with control charts on the assumption of a small drift. Equally, there are a few studies about new control charts developed specifically to detect small linear drifts. However, this research shows poor performance. For example, Davis and Woodall (1988) assessed the traditional trend rules for control charts under drift and concluded, "these charts are ineffective in detecting drifts" (p. 262).

On the other hand, Fahmy and Elsayed (2006) introduced a special drift-detection control chart using a moving window of size w, by estimating a simple lineal regression via ordinary least square (OLS) on each window, to fit a linear equation in order to obtain the estimated mean, which is compared with the observed mean under the hypothesis of no drift. After that, Fahmy and Elsayed constructed a Chi-squared statistic using the estimated and observed values, and compared the performance of their new chart with the performance of the EWMA chart. The result of this procedure is that the moving window

procedure require more computational work, and shows no significant performance, as the EWMA control chart does. These examples and others like Zou et al. (2009) show that the EWMA control chart remains a good candidate for detecting drifts, as well as for shift monitoring. Most of these studies make use of Monte Carlo simulation to obtain the performance measures; that is done by fixed the average run length under the hypothesis of in-control statistical (ARL_0) and comparing the average run length under the out-of-control statistical (ARL_1).

Purpose of Study

In this aforementioned sense, this research aims to review the literature of those control charts that has been developed specifically to detect small linear trend that drift away from the goal value and when the sample size is equal to one. Also, this study examines several of the traditional control charts under the assumption of small drift, like the exponentially weighted moving average control charts (EWMA CC) and the double exponentially weighted moving average control charts (DEWMA CC). Specifically, this study reviews two control charts that are being created to detect linear drift: the generalized likelihood ratio (GLR) and the Fahmy and Elsayed (2006) control charts. Furthermore, a new control chart is proposed based on a linear prediction, using the fundamental theorem of exponentially smoothing prediction, first presented by Brown and Meyer (1961). This study also contrasts the performance between actual control charts to detect shifts, the traditional control charts for detecting drift, and the new control chart proposed in this research. These comparisons are done assuming a small linear drift.

Research Questions

In Chapter III, a new control chart is presented, focusing on detecting a linear trend. This new chart is called "The Double Exponentially Weighted Moving Average based on a Linear Prediction" (DEWMABLP). It is proposed to evaluate the performance of this new control chart versus those control charts that have shown a good performance in detecting linear drifts. The comparison was done mainly versus the EWMA control chart because it was the best candidate for detecting drifts in mean monitoring as the literature review shows thus far (Knoth, 2012). The research questions are as follows:

Q1 How can the new DEWMABLP control chart be used to detect linear drift in a process?

Q2 How does the new DEWMABLP control chart perform better than the EWMA control chart for detecting linear drift in a process?

Q3 For which parameters and slopes does the new DEWMABLP control chart detects quicker an out-of-control than the EWMA, GLR and FH control charts under linear drift?

Limitations of Study

This research is limited in some aspects, as much research is. The limitations are stated to help readers obtain a clear idea of this work and be able to replicate this study. The essay is limited to the case of univariate control charts under the assumption of linear drift or trend, considering a sample size of one. This dissertation used the Monte Carlo simulation methodology, considering the fact that normal random samples will be generated from a computer unless other indications are given. Due to the limitations of time and accesses to software, data were generated and manipulated in *R* software, as well as the computations needed to construct control charts and their performance indicators.

CHAPTER II

LITERATURE REVIEW

This chapter reviews existing control charts to detect a shift in process, and in essence, reviews classical univariate control charts focused on detecting big change in the mean process and those which work well to detect a small shift in the mean process. Also, it considers that few control charts are actually developed to detect linear drift, as mentioned in Knoth (2012). Additionally, this literature review includes the forecast methods used for exponential smoothing

Review of Univariate Control Charts

This section reviews the Shewhart control chart that is used to detect large shifts in the mean process. Also, the case for individuals is explained. It is well known that the Shewhart chart works well to detect out-of-control when the shift is more than three times the standard deviation of the process. The classical Shewhart chart model is defined as follows: Let w_i be a sample statistic measuring a quality characteristic of interest, where μ_w is the mean of w_i, and σ_w is the standard deviation of w_i, with $i = 1,2, \dots, n$. Then, the center line (CL), the upper control limit (UCL), and the lower control limit (LCL) are given as:

$$UCL = \mu_w + L\sigma_w$$

CL= μ_w

$$LCL = \mu_w + L\sigma_w \qquad (2.1)$$

where L is the "distance" of the control limits from the center line, expressed in L times the standard deviation. For many purposes, the control chart is used for online process monitoring or surveillance. That is, sample data is drawn and used to build the control chart, and if the sample values of w_i lie within the control limits and do not reveal any systematic repetition, it would say the process is in-control. Otherwise, it says the process is out-of-control.

Thus, the most common Shewhart control chart for variables is the so-called "Control Chart for $\bar{x}$ and R". Control charts are constructed assuming that the quality characteristic of interest is distributed approximately normally, with mean μ and standard deviations σ, where both μ and σ are known. Then, if $x_1, x_2, \dots, x_n$ represent a random sample of size n, the mean of this sample is $\bar{x} = \frac{x_1+x_2+\cdots+x_n}{n}$. It is well known that $\bar{x}$ is normally distributed with mean μ and standard deviation $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$. The previous result is valid when it is assumed that the distribution of the quality characteristic is normal. Furthermore, this result is still approximately precise, even if the underlying distribution is non-normal, due to the central limit theorem. In practice, μ and σ are unknown. Therefore, they need to be estimated from initial samples. To estimate these parameters m samples of size n are obtained. Let $\bar{x}_1, \bar{x}_2, \dots, \bar{x}_m$ represent the sample average of each these m samples. Then the best estimator of μ, the process average value, is the grand average $\bar{\bar{x}} = \frac{\bar{x}_1+\bar{x}_2+\cdots+\bar{x}_m}{m}$. The $\bar{\bar{x}}$ is used as a central line. The classical manner to construct the control limits is by using an estimate of the standard deviation σ. This estimation can be calculated by using the ranges method, using the m samples. The range method considers computing the range for each of the m samples $x_1, x_2, \dots, x_n$ of size n,

and the range of each sample is the difference between the largest and smallest observations, that is, $R = x_{max} - x_{min}$. Next, with these $R_1, R_2, \ldots, R_m$ ranges, the average range is estimated as $\bar{R} = (R_1 + R_2 + \cdots + R_m)/m$. The estimations are $\hat{\mu} = \bar{\bar{x}}$ and $\hat{\sigma} = \bar{R}/d_2$, where d_2 is the mean of $W = R/\sigma$, the relative range. Values of d_2 can be found in the appendices of most Statistical Process Control books; for example, Table VI in Montgomery (2007). In this manner, the $\bar{x}$ and R control charts are constructed. The center line, upper control line and lower control line for the $\bar{x}$ control chart are:

$$UCL = \bar{\bar{x}} + A_2\bar{R}$$

$$\text{CL} = \bar{\bar{x}}$$

$$LCL = \bar{\bar{x}} - A_2\bar{R} \tag{2.2}$$

where

$$A_2 = \frac{3}{d_2\sqrt{n}} \tag{2.3}$$

and the center line, upper control line, and lower control line for the R control chart are:

$$UCL = D_4\bar{R}$$

$$\text{CL} = \bar{R}$$

$$LCL = D_3\bar{R} \tag{2.4}$$

where

$$D_3 = 1 - 3\frac{d_3}{d_2} \; and \; D_4 = 1 + 3\frac{d_3}{d_2} \tag{2.5}$$

where d_3 is used to estimate the standard deviation of the ranges R as:

$$\hat{\sigma}_R = d_3 \frac{\bar{R}}{d_2} \tag{2.6}$$

Values of d_3 also can be found in the appendices of most of the statistical process control books.

The Control Chart for Individual Measurements

In practice, a sample size $n = 1$ is frequently used for monitoring purposes. That is, the sample only consists of one unit. For instance, an automatic examination is made for every unit produced, or data can only be obtained in a relatively slow way. Therefore, it is problematic to accept sample sizes greater than 1 to make the analysis. This problem occurs frequently in both manufacturing and nonmanufacturing circumstances. Many other examples can be seen in Montgomery (2007). In such circumstances, the control chart for individual measurements can be very useful. In order to construct the Individuals Control Chart, it is necessary to use the moving range of two consecutive observations to be able to estimate the process variability. The moving range is defined as:

$$MR_i = |x_i - x_{i-1}|, \quad i = 2,3, \dots, m$$

and the average of the moving ranges of two observations is defined as:

$$\overline{MR} = \sum_{i=2}^{m} \frac{MR_i}{m-1} \tag{2.7}$$

Therefore, the Control Chart for Individual Measurements is constructed with its center line, upper control line, and lower control line for the x_i as:

$$UCL = \bar{x} + 3\frac{\overline{MR}}{d_2}$$

CL= $\bar{x}$

$$LCL = \bar{x} - 3\frac{\overline{MR}}{d_2}$$

(2.8)

where $d_2 = 1.128$ because of $n = 2$, taken from Appendix VI (Montgomery, 2007, p. 720).

Control Charts to Detect Small Shifts

It is well known in the control chart literature that Shewhart control charts work poorly when detecting small shifts. This disadvantage is mainly due to Shewhart control charts only using the information of the last period of observation, ignoring any given information by the entire sequences of data. As a result, it makes the Shewhart control chart relatively insensitive to detecting small shifts of less than 1.5 of the standard deviation of the process. It is also known that two good alternatives for detecting small changes are the cumulative sum (CUSUM) control chart, and the exponentially weighted moving average (EWMA) control chart (Montgomery, 2007).

Cumulative Sum Control Chart

Cumulative sum control charts were first proposed by Page (1954). The construction and use of CUSUM control charts are explained extensively in Hawkins and Olwell (1998). If a small shift in a process occurs the Shewhart will not detect promptly

because it only considers the last information. However, the CUSUM control chart incorporates all the information in the sequences of all sample values by calculating the cumulative sum of the deviations of each sample value with respect to a target value. For a random sample of size one $x_1, x_2, \dots, x_m \sim N(\mu, \sigma)$ the statistic

$$C_i = \sum_{j=1}^{i} (\bar{x}_j - \mu_0)$$

is plotted against the sample number i. The CUSUM control chart is very effective for individuals. In order for the CUSUM to be a control chart the statistic C_i needs to have control limits. There are two ways to build the control limits for CUSUM chart: the tabular method and the U-Mask. The most common method is the tabular, and it is the only technique presented here. The tabular method considers x_i the i^{th} observation of a process when the process is in-control, with $x_i \sim N(\mu_0, \sigma)$ and $\mu_0 =$ desired target. The CUSUM control chart accumulates deviations from μ_0 that are above the target with the statistic C_i^+, and accumulates deviation from μ_0 that are below the target with another statistic C_i^-. Then C_i^+ and C_i^- are named one-sided upper and lower CUSUMs control limits, respectively. The tabular CUSUMs control limits are computed as follows:

$$C_i^+ = \max[0, x_i - (\mu_0 + K) + C_{i-1}^+] \tag{2.9}$$

$$C_i^- = \max[0, (\mu_0 + K) - x_i + C_{i-1}^-] \tag{2.10}$$

where the starting values are $C_i^+ = C_i^- = 0$, and K is called the reference and it is often chosen about halfway between the target μ_0 and the out-of-control value of the mean μ_0 that we are interested in detecting quickly. Thus, if the shift is expressed in standard

deviation units as $\mu_1 = \mu_0 + \delta\sigma$(or $\delta = |\mu_1 - \mu_0|/\sigma$ then K is one-half the magnitude of the shift or

$$K = \frac{\delta}{2}\sigma = \frac{|\mu_1 - \mu_0|}{2}$$

Exponentially Weighted Moving Average Control Chart

The EWMA control chart was introduced by Roberts (1959). According to Lucas and Saccucci (1990), the exponentially weighted moving average (EWMA) control chart has been a good alternative to the Shewhart control chart, when researchers are interested in detecting small shifts. Lucas and Saccucci (1990) also studied the performance of the EWMA control chart, concluding that the performance of the EWMA is very similar to the performance of the CUSUM control chart. In practice, the EWMA control chart is easier to establish and operate than the CUSUM control chart (Montgomery, 2007). As with the CUSUM, the EWMA is generally used with individual observations, therefore, this will be discussed when $n = 1$.

For an independent $x_i \sim N(\mu_0, \sigma), i = 1,2, \dots, n$ the EWMA control statistic S_i is explained by Montgomery (2007) as:

$$S_i = \lambda x_i + (1 - \lambda)S_{i-1} \tag{2.11}$$

where $0 < \lambda < 1$ and $S_0 = \mu_0$. It can be shown that

$$E(S_i) = \mu_0 \tag{2.12}$$

and

$$Var(S_i) = \left(\frac{\lambda}{2 - \lambda}\right)\left[1 - (1 - \lambda)^{2i}\right]\sigma^2$$

(2.13)

For large values of i, the asymptotic variance becomes:

$$Var(S_i) = \left(\frac{\lambda}{2-\lambda}\right)\sigma^2$$

(2.14)

Therefore, the control limits and center line become:

$$UCL = \mu_0 + k\sigma\sqrt{\left(\frac{\lambda}{2-\lambda}\right)}$$

$$CL = \mu_0$$

$$LCL = \mu_0 - k\sigma\sqrt{\left(\frac{\lambda}{2-\lambda}\right)}$$

(2.15)

where k represents the times number of the standard deviation and is selected for a given lambda such the average run length under in-control $ARL_0 \cong 370$ (Montgomery, 2007). For example, Crowder (1987) shows that for $\lambda = 0.1$ and $k = 2.7$ the $ARL_0 \approx 370$.

Practitioners in industry prefer uses the EWMA control chart instead the CUSUM chart because EWMA is easier to set up and operate (Montgomery, 2007).

Double Exponentially Weighted Moving Average Control Chart

A double exponentially weighted moving average (DEWMA) control chart was initially developed and evaluated in 1992 by Shamma and Shamma (1992). Later, Zhang and Chen (2005) presented an extension of the exponentially weighted moving average (EWMA) technique to a double exponentially weighted moving average (DEWMA) technique. In fact, these two DEWMA are both the same, as well as their conclusions.

Zhang and Chen conclude that the DEWMA mean chart performs better than the EWMA mean chart when the process mean shifts are smaller than one half of the process standard deviation. For larger mean shifts, the DEWMA chart and the EWMA chart perform similarly. Other research regarding DEWMA was developed, taking the DEWMA control chart as reference. For example, Mahmoud and Woodall (2010) conducted a study to compare some characteristics between the EWMA and DEWMA. Alkahtani (2013) assessed the robustness of DEWMA and EWMA control charts for non-normal processes. Also, extensions for a multivariate DEWMA CC case exist. For example, Alkahtani and Schaffer (2012) developed a multivariate DEWMA control chart for detecting shifts in the mean vector of a multivariate normal quality characteristic distribution.

The aforementioned research is based on the assumption that data are a time series of x_i random values form $i = 1$ to n with a normal distribution. Initially $x_i \sim N(\mu_0, \sigma)$, and plots the individuals for the double exponentially weighted moving average $S_i' = \lambda S_i + (1-\lambda)S_{i-1}'$, where $S_i = \lambda x_i + (1-\lambda)S_{i-1}$ with its corresponding initial values $S_0' = S_0 = \mu_0$. The control chart is built by plotting the value S_i' with its limits, using *k* times the variance of S_i'. That is, the double exponentially weighted moving average value is plotted with the upper and lower limits versus i.

For a $x_i \sim N(\mu_0, \sigma), i = 1,2,\dots,n$ the DEWMA control statistic S_i' was developed firstly by Shamma and Shamma (1992), and is defined as:

$$S_i' = \lambda S_i + (1-\lambda)S_{i-1}' \tag{2.16}$$

$$S_i = \lambda x_i + (1-\lambda)S_{i-1} \tag{2.17}$$

where $0 < \lambda < 1$ and $S_0 = S_0' = \mu_0$. It can be shown that

$$E(S_i') = \mu_0$$

(2.18)

and

$$Var(S_i')$$

$$= \lambda^4 \frac{1 + (1-\lambda)^2 - (i^2 + 2i + 1)(1-\lambda)^{2i} + (2i^2 + 2i - 1)(1-\lambda)^{2i+2} - i^2(1-\lambda)^{2i+4}}{(1-(1-\lambda)^2)^3}\sigma^2$$

(2.19)

For large values of i, the asymptotic variance becomes:

$$Var_{asymp}(S_i') = \frac{\lambda(2 - 2\lambda + \lambda^2)}{(2-\lambda)^3}\sigma^2$$

(2.20)

Then for large values of i the control limits become:

$$UCL = \mu_0 + k\sigma\sqrt{\frac{\lambda(2 - 2\lambda + \lambda^2)}{(2-\lambda)^3}}$$

$$CL = \mu_0$$

$$LCL = \mu_0 - k\sigma\sqrt{\frac{\lambda(2 - 2\lambda + \lambda^2)}{(2-\lambda)^3}}$$

(2.21)

Mahmoud and Woodall (2010) show how the previous variances can be obtained.

Control Chart Used for Data with a Trend Since Beginning of Process

As mentioned previously, many control charts have been developed for different purposes. In order to clarify the purposes of this study, this section introduces one of the

control charts that seems to be related with the goal of this research, nevertheless, this chart is not related with this study.

A control chart designed to study tool wear, when the tool comes under wear since the beginning of the process is the control chart for tool wear. This control chart is explained by (Montgomery, 2007). Tool wear is present since the beginning of production and is it is expected that the tool will need to be exchanged after a certain period of work. When tool wear occurs, it is common to find that the variability of the process at any one point in time is significantly less than the acceptable variability over the whole life of the tool. Moreover, as the tool wears out, there will be an upward (or downward) drift or trend in the mean since the beginning, caused by the damaged tool creating bigger (or smaller) magnitudes. In such cases, the distance between the specification limits is generally much greater than six times the standard deviation of the process. Subsequently, the adapted control chart model can be applied to the tool-wear problem. This procedure is illustrated in Figure 2.1. The original setting for the tool is at a multiple of standard deviation of the value above the lower specification limit, and the maximum permissible process average is at the same time a multiple of standard deviation of the value below the upper specification limit. If the rate of wear is known, or can be estimated from the data, it is possible to construct a set of inclined control limits around the tool-wear trend line. If the sample values of the measurement fall within these limits, the tool wear is in-control. Finally, when the trend line exceeds the maximum upper specification limit, the process should be reset, or the tool will be replaced.

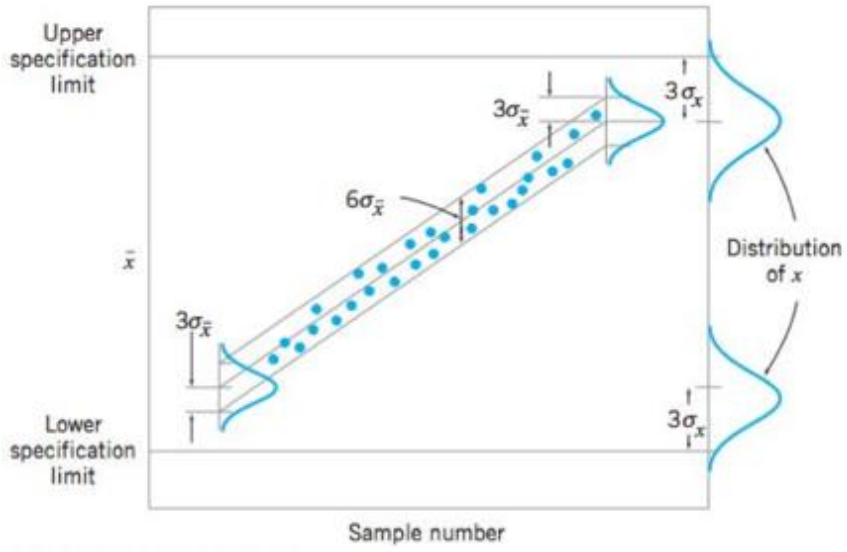

Figure 2.1. Control chart for tool wear.

Control charts for tool wear are discussed in more detail by Duncan (1986). However, it is not the intention of this research to review control charts based on models for autocorrelated observations. As previously mentioned, the goal of this research focuses on those process that have a period of stability and then, after this period, a linear trend or a drift suddenly appears. A few control charts have been developed to detect linear and a nonlinear drift after a period of stability, and several of these control charts will be commented on the next section.

Control Charts Developed to Detect Small Drift Instead of Small Shifts

Industrial process quality controls frequently use the exponentially weighted moving average (EWMA) control chart and the double EWMA (DEWMA) control chart to detect small shifts in a process where sample size is $n = 1$. These studies focus on detecting small shifts in the process. In practice, however, it occasionally is desired to detect small trends instead of shifts in the process. The effectiveness of these methods to

determine small trends in a process have not been thoroughly researched in the current literature. Knoth (2012) reviewed papers on the industrial practice of gradual change due to tool wear or other causes, and discusses a small number of existing papers on control charts for detecting the out-of-control of the mean under linear drift. Some of these control charts developed specifically to detect drifts, and studied by Knoth (2012), are the generalized likelihood ratio charts for drift (Zou et al. 2009), and the Fahmy and Elsayed (2006) control chart based on a rolling window. These two charts are described briefly in the next section.

Generalized likelihood ratio (GLR) control chart for drift. The construction of the GLR control chart for drift is explained by Zou et al (2009) and by Xu (2013) as follows. Let $\boldsymbol{x_i}$ be a sequence of $\boldsymbol{x_i \sim N(\mu_0, \sigma_0), i = 1, 2, \dots, k}$ of identical independent samples of size $\boldsymbol{n = 1}$, where $\boldsymbol{\mu_0 = \mu}$ = goal mean and $\boldsymbol{\sigma_0}$ = standard deviation. Suppose that there is a drift in mean from its in-control value $\boldsymbol{\mu_0}$ starting at some time $\boldsymbol{\tau^*}$ between observation $\boldsymbol{x_\tau}$ and $\boldsymbol{x_{\tau+1}}$. Then the process mean at time $\boldsymbol{t \geq \tau^*}$ is $\boldsymbol{\mu(t) = \mu_0 + \beta(t - \tau^*)\sigma_0}$, where $\boldsymbol{\beta}$ is the standardized linear slope of trend. The log likelihood at time $\boldsymbol{k}$ is

$$lnL\left(\tau, \tau^*, \beta \middle| x_1, x_2, \dots, x_k\right)$$

$$= -\frac{k}{2}\ln[(2\pi)\sigma_0^2 - \frac{k}{2\sigma_0^2}\sum_{t=1}^{\tau}(x_t - \mu_0)^2 - \frac{1}{2\sigma_0^2}\sum_{t=\tau+1}^{k}[x_t - \mu_0 - \beta(\tau - \tau^*)\sigma_0^2]^2. \tag{2.22}$$

Under the hypothesis that there have been no changes in μ_0, the log likelihood function at time k is given by

$$lnL\left(\infty,\infty,0\middle|x_{1,}x_2,\dots,x_k\right)=-\frac{k}{2}\ln[(2\pi)\sigma_0^2-\frac{1}{2\sigma_0^2}\sum_{t=1}^{k}[x_t-\mu_0]^2$$

(2.23)

If a drift has been in μ beginning between the samples τ and $\tau+1$, the constrained maximum likelihood estimator (MLE) of the rate of linear trend of β and the change point τ^*can be derived by taking the partial derivatives of the log likelihood function, with respect to β and τ^*, respectively, and setting derives to zero. As a result, the restricted MLE of β and τ^* must satisfying the equations

$$\beta=\frac{\sum_{t=\tau}^{k}(x_t-\mu_0)t-\tau^*\sum_{t=\tau}^{k}(x_t-\mu_0)}{\sigma_0\sum_{t=\tau+1}^{k}t^2+\sigma_0\tau^{*2}(k-\tau)-2\sigma_0\tau^*\sum_{t=\tau+1}^{k}t},\tau^*\epsilon[\tau,\tau+1),$$

(2.24)

$$\tau^*=\frac{\sigma_0\beta\sum_{t=\tau+1t}^{k}t-\sum_{t=\tau+1}^{k}(x_t-\mu_0)}{\sigma_0\beta(k-\tau)},\tau^*\epsilon[\tau,\tau+1),$$

(2.25)

Xu (2013) states that an iterative procedure is necessary to solve for these two parameters $\hat{\beta}$ and $\widehat{t^*}$. Therefore, the log likelihood ratio statistic to determine whether the process is in-control or in a drift on the mean within any time interval $[\tau,\tau+1),\tau=0,1,2,\dots,k-1$, is computed as

$$R_{k,m1,m2}^{D}$$

$$=ln\frac{\max\limits_{\max(0,k-m_1)\le\tau\le k-m_2,\tau\le\tau^*<\tau+1,\beta}L(\tau,\tau^*,\beta|x_t,t=1,\dots,k)}{L(\infty,\infty,0|x_t,t=1,\dots,k)}$$

$$= \max_{\max(0,k-m_1)\le\tau\le k-m_2,\tau\le\tau^*<\tau+1,\beta} \left\{\frac{1}{2\sigma_0}\left[2\beta\sum_{t+\tau+1}^{k} t\left(x_t-\mu_0\right)\right.\right.$$

$$\left.\left.-2\beta\tau^*\sum_{t=\tau+1}^{k}\left(x_t-\mu_0\right)-\sigma_0\beta^2\sum_{t=\tau+1}^{k}(t-\tau^*)^2\right]\right\}$$

(2.26)

The GLR control chart will deliver an out-of-control signal at sample k if $R^D_{k,m1,m2} > h_{GRL}$, where h_{GRL} is the control limit that is selected to obtain a specified in-control average run length (ARL) performance. The values of m_1 and m_2 are selected to fix a window size of the GLR control chart. The selection of the window's size is fundamental and impacts directly on the computational time to estimate the parameters via the maximum likelihood estimator (MLE) method. Xu (2013) states that window sizes for GLR statistics should be considered on a case-by-case basis. Lai (1998) shows the optimal way to select the optimal window size. The method is complex, although most authors justify the use of GLR charts because they can be easy for the practitioner to use because they do not require specification of any parameter, and have the advantage of estimate the point change and the drift rate immediately. However, it is important to say that an expert always has to set up the upper and the lower control limits with the careful selection of the window's parameters.

Fahmy and Elsayed (FE) chi-squared control chart. Fahmy and Elsayed (2006) developed a special drift-detection control chart. Essentially, they use a rolling window of size $\boldsymbol{w}$ and calculate an ordinary least squares (OLS) estimate on each window between the fit of the observation and the observation number, to determine $\widehat{\boldsymbol{\mu}}_{\boldsymbol{wn}} = \widehat{\boldsymbol{\alpha}}_{\boldsymbol{n}} + \widehat{\boldsymbol{\beta}}_{\boldsymbol{n}}\boldsymbol{t}_{\boldsymbol{w}}$ as an final estimate of the mean, where $\widehat{\boldsymbol{\mu}}_{\boldsymbol{wn}} =$ mean estimate value in window of

size $\boldsymbol{w}$ at time $\boldsymbol{n}$, $\widehat{\boldsymbol{\alpha}}_{\boldsymbol{n}}$= estimated intercept at time $\boldsymbol{n}$, and $\widehat{\boldsymbol{\beta}}_{\boldsymbol{n}} =$ the estimated slope for the window $\boldsymbol{w}$ at time $\boldsymbol{n} = \boldsymbol{t}$. Then, authors create

$$M_n = \frac{(\mu_0 - \hat{\mu}_{wn})^2}{1/w + (t_w - \bar{t})^2 / S_{tt}} \text{ with } S_{tt} = \sum_{i=1}^{w} (t_i - \bar{t})^2.$$

It can be shown that in the in-control case of no drift, M_n follows a Chi-squared distribution with one degree of freedom. Fahmy and Elsayed do not consider the autocorrelation of M_n, and construct a control chart like the Shewhart control chart. This is a one-side control limit. The upper control limit for this chart is obtained by solving

$$P(\chi_1^2 > UCL | \mu_t = \mu_0) = \alpha$$

where α is the probability of type I error. It is well known that for $\alpha = 0027$, the UCL = 8.999 and the in-control $ARL = \frac{1}{\alpha} = \frac{1}{0.0027} = 370.37$. Fahmy and Elsayed (2006) reported that the average run length under out-of-control (ARL_1) for their chart is smaller than the ARL_1 of the EWMA control chart when bigger slopes, greater than 1, and bigger values for lambda greater than 0.10, the parameter of the EWMA control chart.

Standard Chart Performance in Linear Drift Condition

After a fairly comprehensive literature review of the use of control charts monitoring linear drift, it can be concluded that the performance of the Shewhart control chart has not been reported throughout under the drift condition, or at least this is not stated frequently. The classical CUSUM, EWMA and generalized EWMA have been designed to detect shifts, and the FE and GLR control charts are designed specifically to detect drift, have been studied. The results are that the Fahmy and Elsayed Chart and GLR chart need more computational effort and do not exhibit better performance than the

classical control charts under drift (Knoth, 2012). Knoth (2012) also state that FE and GLR charts only show better performance in certain specifications under rolling windows conditions. Moreover, the GLR consumes a considerable amount of computational time. The EWMA chart also remains a good candidate for detecting drifts. The classical charts such as CUSUM and the EWMA for mean surveillance are also sufficiently sensitive to detect drifts, even small ones. The performance of the DEWMA is good for detecting small shifts, however, it has a poor performance when detecting drift or linear trends. Knoth (2012, p. 65) states "the actual schemas developed specifically for detecting drift instead of a step change are not really worth the effort". Therefore, there the statistical monitoring under drift condition is an open research area.

An important part of this study is a proposed of a new control chart to detect small linear trends in the process. The new chart is based on a linear prediction using a double exponentially weighted moving average. This prediction or forecast is generated using simple forecast techniques. The next part of this chapter contains a review of the literature for some basic forecasting techniques in a time series.

Exponential Smoothing Forecast Methods

The exponential smoothing forecasting methods began in the 1950s from the original work of Brown (1962) and Holt (1960), who worked on predicting the inventory of control systems. The basic idea of smoothing models is to build predictions for future values, providing weighted averages of past observations, with the more recent observations given more weight to determine the forecasts. Brown and Meyer (1961) proposed using the smoothing technique to forecast the demand for goods. These forecast methods are the basis of other more complex forecast methods. Smoothing techniques to

produce forecasting are well known in business, where it is essential to predict the demand for goods and services (Hanke and Wichern 2009).

Fundamental Theorem of Exponential Smoothing

The fundamental theorem of exponential smoothing developed by Brown and Meyer (1961) assumes a sequence of x_i, with $i = 1, 2, 3, ...$ observations that are equally spaced in the time, then the first $N + 1$ degrees of exponential smoothing can be expressed using binomial coefficients to provide an estimate of the values of an Nth degree polynomial model of observations to date, evaluated at the time of the most recent observation. In a formal manner, the fundamental theorem of exponential smoothing is expressed as:

Theorem: If $x_{t+r} = a_t + b_t\tau + c_t\tau^2 + \cdots + g_t\tau^N$ then the coefficients $a_t, b_t, \ldots, g_t$ can be estimated as linear combinations of the values resulting from the first $N + 1$ degrees of smoothing applied to x. In particular

$a_t = [I - (I - S)^{N+1}]_t(x)$

with

$S_t^0(x) = I_t(x) = x_i$

The other coefficients involve the values of the smoothing constant λ. The simplest model is the so-called Simple Exponential Smoothing, when there is a time series as $x_1, x_2, \ldots, x_{t-1}$ and it is required to forecast the next value of time series x_t. The forecast is denoted by $\hat{x}_t$.When the data x_t is available, the forecast error can be found to be $x_t - \hat{x}_t$. The simplest method from Brown (1962) takes the forecast for the previous period and calculates the new forecast by $\hat{x}_{t+1} = \hat{x}_t + \lambda(x_t - \hat{x}_t)$, where λ is a constant between 0 and 1. Another way to write this equation is $\hat{x}_{t+1} = \lambda\hat{x}_t + (1 - \lambda)\hat{x}_t$. Frequently, $\hat{x}_{t+1}$

is substituted by S_t, then the equation becomes $S_t = \lambda\hat{x}_t + (1-\lambda)S_{t-1}$. The last equation is used to predict a variable of interest, like an inventory when the mean level has no trend; that is, when a constant mean value is expected in the variable of interest over the time.

An example of Brown's simple exponential smoothing model is shown in Figure 2.2. In this example, the average level of the series is between 300 and 700 units, and there does not seem to be any linear trend in the series.

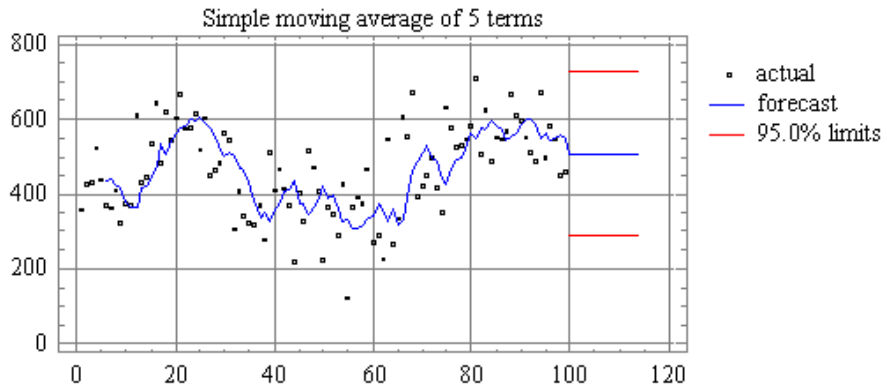

Figure 2.2. Simple moving average.

A second model with a local linear prediction can be forecast by a double exponentially weighted moving average with a linear relationship by the following equation:

$$F_{t+i} = a_i + b_i t \tag{2.27}$$

where:

F_{t+i} = forecast for the t period after i at time i,

$a_i = 2S_i - S_i'$ and

(2.28)

$$b_i = \frac{\lambda}{1-\lambda}(S_i - S_i') \tag{2.29}$$

with

$$S_i = \lambda x_i + (1-\lambda)S_{i-1} \tag{2.30}$$

and

$$S_i' = \lambda S_i + (1-\lambda)S_{i-1}' \tag{2.31}$$

S_i and S_i' are called the single and double smoothing values at time i of the time series. Details of the development of these equations can be seen in Brown (1962) and Yates (1968). Also, a similar linear prediction equation as shown in equation (2.27) can be built using the Holt forecast equations or moving average equations, or other forecast techniques as explained in Hanke and Wichern (2009).

In the same manner, an example of Brown's (1962) double exponential smoothing model is shown in Figure 2.3. In this example, an average level between at the 70 and 110 units of traffic can be observed. At the end of the series, a negative trend just after the 1/83 period can be appreciated. The negative trend is a forecast of Brown's double smoothing exponential moving average model.

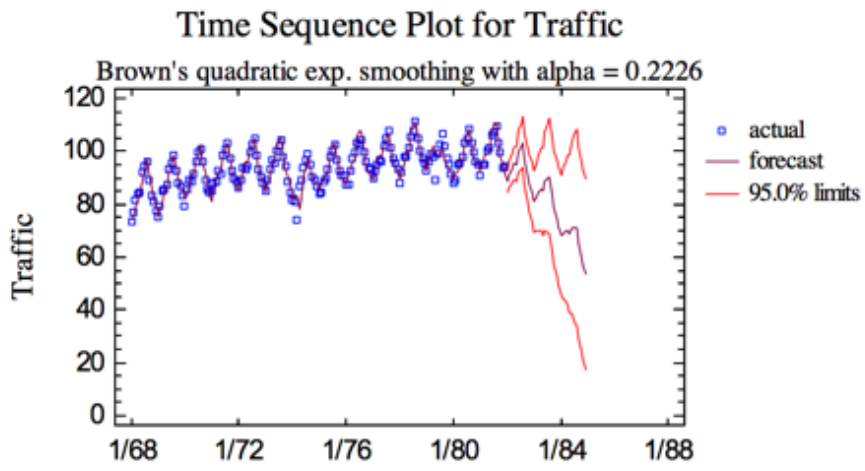

Figure 2.3. Negative trend double smooth exponential.

In a similar way, a triple smoothing exponential moving average can be expressed by the fundamental theorem of exponential smoothing by the following equation:

$$F_{i+\tau} = a_i + b_i\tau + \frac{1}{2}c_i\tau^2 \tag{2.32}$$

where:

$F_{i+\tau}$ = forecast in the $i + \tau$ period,

$$a_i = 3S_i - 3S_i' + S_i'', \tag{2.33}$$

and

$$\mathrm{b_i} = \left[\frac{1}{2}\lambda(1-\lambda)^2\right][(6-5\lambda)\mathrm{S_i} - 2(5-4\lambda)\mathrm{S_i'} + (4-3\lambda)\mathrm{S_i''}] \tag{2.34}$$

$$\mathrm{c_i} = [\lambda^2/(1-\lambda)^2][\mathrm{S_i} - 2\mathrm{S_i'} + \mathrm{S_i''}] \tag{2.35}$$

with

$$S_i = \lambda x_i + (1-\lambda)S_{i-1}$$

(2.36)

and

$$S_i' = \lambda S_i + (1 - \lambda) S_{i-1}'$$

(2.37)

and

$$S_i'' = \lambda S_i' + (1 - \lambda) S_{i-1}''$$

(2.38)

The triple smoothing exponential moving average can be used to approximate locally a model where it is suspected that a phenomenon follow a quadratic equation.

Relationship Between the Exponential Smoothing Forecast Models and the Autoregressive Integrated Moving Average Models

Users of the exponential smoothing methods may think that exponential smoothing is a tool that is not objective in statistical identification and diagnostic systems for evaluating the "goodness of fit" (Fomby, 2008). For example, the smoothing parameters of the smoothing models are selected arbitrary to estimate a smooth prediction, but are not based on any statistical inferential criteria, like test of hypotheses relating parameters or tests of normality in the errors created by the model. However, some of the linear exponential methods are equivalent to the autoregressive integrated moving average (ARIMA) models developed by Box, Jenkins, Reinsel, and Ljung (2015). The developed methodology of Box et al. allows us to adequately identify and calculate estimated values for parameters in the simple and in the double exponential weighted moving average model. Consequently, the exponential smoothing moving average models can have this property. This section presents some ARIMA equivalents of

the simple exponential moving average model and the double exponential moving average model.

Hyndman, Koehler, Ord, and Snyder (2008) show how the simple exponential smoothing model $S_t = \lambda\hat{x}_t + (1-\lambda)S_{t-1}$, that is used when the time series data have no trend and no seasonality, is related to the ARIMA (0,1,1) model. This ARIMA model is $(1-B)y_t = (1-B\theta)a_t$, where $\theta = 1-\lambda$, and B represents the backshift operator such that $B^r x_t = x_{t-r}$ for any given time series x_i. The double exponential smoothing model is given by the model equations (2.27) – (2.31). The ARIMA model equivalent to the linear exponential smoothing model is the ARIMA (0,2,2) model $(1-B)^2 y_t = (1-B\theta)^2 a_t$, where $\theta = 1-\lambda$. Nevertheless, not all exponential smoothing models have an ARIMA equivalent model. Gardner and McKenzie (1988) explain that all linear exponential smoothing models have equivalent ARIMA models, however, the equivalence of ARIMA models is not extended to the nonlinear exponential smoothing methods.

This study mainly will use the double exponential smoothing forecast to construct a proposed for a new control chart based on this linear prediction. Researches show that the DEWMA and EWMA control charts work efficiently to detect small shifts when the mean of the process has changed slightly, and the classical Shewhart control chart works well to detect big shifts (more than twice the standard deviation of the process). However, what happens if, after a period of stability, the process has a permanent small change? In other words, there is a linear trend or drift in the sequence of x_i. This study aims to detect a linear trend in the process instead of a shift. For this reason, the study presented here

proposes a new double EWMA control chart based on a liner prediction, making use of a basic forecast techniques.

CHAPTER III

METHODS

A Proposed Control Chart to Detect Small Change in Trend

This section presents a new control chart to detect linear trends. The development of these charts is made using equations (2.27) – (2.31) for the double exponentially weighted moving average with the linear relationship.

The main idea is to use the components of equation 2.27, $F_{i+t} = a_i + b_i t$, to build three individual control charts under the null hypothesis of in-control process, assuming a sequence of $x_i \sim N(\mu_0, \sigma^2)$. The first control chart is for the values of a_i, who represent the intercept of the lineal equation at time i. The center line is $E(a_i) = \mu_0$ and the upper and lower control limits are given by $E(a_i) \pm k\sqrt{Var(a_i)}$. This control chart tests the null hypothesis that the forecast level is equal to $\mu_0, [i.e\ E(a_i) = \mu_0]$ at time i.

The second control chart is for the values of b_i, slopes at time i. The control chart for the forecast of the slope at time i has as center line the expected value under in-control, that is $E(b_i) = 0$, and the upper and lower control limits as $E(b_i) \pm k\sqrt{Var(b_i)}$. This control chart tests the null hypothesis that the expected value of the slope $E[b_i] = 0$ at time i. (i.e., the forecast has not linear trend) versus the alternative hypothesis $b_i \neq 0$, that is, the slope differs from zero. The main idea is try to detect a change quickly when the slope differs from zero.

The third control chart is the sum $F_{i+t} = a_i + b_i t$, a control chart for the smoothing forecast assuming a linear prediction, where the center line is $E(F_{i+t}) = E(a_i + b_i t) = E(a_i) + E(b_i)t$ and the upper and lower limits can be built as $E(F_{i+t}) \pm k\sqrt{Var(F_{i+t})}$. This control chart tests the null hypothesis $E[F_{i+t}] = \mu_0$ at time $i + t$. (i.e. the forecast linear trend is equal to μ_0, the target value at time i) versus the alternative hypothesis $E[F_{i+t}] \neq \mu_0$. That is, the mean level differs from the target at time $i + t$. The principal idea is to detect a linear drift as soon as it occurs using a forecast value one period forward.

This section explains how the new chart is constructed. The double exponentially weighted moving average based on a linear prediction (DEWMABLP) is constructed assuming a sequence of variables $x_i \sim N(\mu_0, \sigma)$, then the DEWMA is $S_i' = \lambda S_i + (1 - \lambda)S_{i-1}'$, where $S_i = \lambda x_i + (1 - \lambda)S_{i-1}$ and the smooth linear forecast is:

$$F_{i+t} = a_i + b_i t \tag{3.1}$$

where

F_{i+t} = forecast in the $i + t$ period,

$a_i = 2S_i - S_i'$ and

$b_i = \frac{\lambda}{1-\lambda}(S_i - S_i')$

F_{i+t} is called the statistic of the DEWMABLP. It is possible to create three control charts: first, a control chart for the intercept a_i that will be very similar to the DEWMA control chart; second, a control chart for the slope b_i, it is used to test if there is a linear

drift or trend; and third, a control chart for a linear prediction one period forward F_{i+t} that can be used to test if the statistic of one period forecast is in statistical control or not.

Intercept of Prediction Double Exponentially Weighted Moving Average Control Chart a_i

The center line for a a_i control chart is the expected value of a_i. It is:

$$\begin{aligned} E(a_i) &= E(2S_i - S_i') \\ &= E(2S_i) - E(S_i') \\ &= 2E(S_i) - E(S_i') \\ &= 2\mu_0 - \mu_0 \\ &= \mu_0 \end{aligned} \tag{3.2}$$

This can be verified using equations (2.16) and (2.17).

The variance of a_i is defined as:

$$Var_{asym}(a_i) = Var(2S_i - S_i'). \tag{3.3}$$

Brown (1962) shows that the asymptotic variance for a predict value of a_i is:

$$Var_{asym}(a_i) = \frac{\lambda(1 + 4(1-\lambda) + 5(1-\lambda)^2)}{(1 + (1-\lambda))^2}\sigma^2. \tag{3.4}$$

For large values of i the control limits for the a_i control chart become:

$$UCL = \mu_0 + k\sigma\sqrt{\frac{\lambda(1 + 4(1-\lambda) + 5(1-\lambda)^2)}{(1 + (1-\lambda))^2}\sigma^2}.$$

$$CL = \mu_0,$$

$$LCL = \mu_0 - k\sigma\sqrt{\frac{\lambda(1+4(1-\lambda)+5(1-\lambda)^2)}{\left(1+(1-\lambda)\right)^2}\sigma^2}.$$

(3.5)

Slope Prediction of Double Exponentially Weighted Moving Average Control Chart (b_i)

In a similar manner, the center line for b_i is the expected value of b_i. Using equations (2.12) and (2.18) it can be shown that:

$$\begin{aligned} E(b_i) &= E\left(\frac{\lambda}{1-\lambda}(S_i - S_i')\right) \\ &= \frac{\lambda}{1-\lambda}(E(S_i) - E(S_i')) \\ &= \frac{\lambda}{1-\lambda}(\mu_0 - \mu_0) \\ &= 0. \end{aligned}$$

(3.6)

The variance of b_i is defined as:

$$\begin{aligned} Var(b_i) &= Var\left(\frac{\lambda}{1-\lambda}(S_i - S_i')\right) \\ &= \left(\frac{\lambda}{1-\lambda}\right)^2 Var(S_i - S_i') \end{aligned}$$

(3.7)

Brown (1962) gives the asymptotic variance of b_i for large values of i as:

$$Var_{asym}(b_i) = \sigma^2 \frac{2\lambda^3}{(1+(1-\lambda))^3}$$

(3.8)

Then, for large values of i the control limits for the b_i chart become:

$$UCL = k\sigma\sqrt{\frac{2\lambda^3}{(1+(1-\lambda))^3}},$$

$$CL = 0,$$

$$LCL = -k\sigma\sqrt{\frac{2\lambda^3}{\left(1+(1-\lambda)\right)^3}}.$$

(3.9)

Control Chart Based on Linear Trend Prediction With Double Exponentially Weighted Moving Average F_t

Using equations (3.2) and (3.5), it can be shown that the expected value of F_t is:

$$\begin{aligned} E(F_t) &= E(a_i + b_i t) \\ &= E(a_i) + tE(b_i) \\ &= \mu_0 + 0 \\ &= \mu_0. \end{aligned}$$

(3.10)

The variance of F_t is:

$$\begin{aligned} Var(F_t) &= Var(a_t + b_t t) \\ &= Var(a_t) + Var(b_t t) + 2cov(a_t, b_t t), \end{aligned}$$

(3.11)

The covariance term $2cov(a_t, b_t t)$ in the previous equation was investigated via simulation to verify the possible independence between a_t and b_t under the null hypothesis of no trend. Simulations for the covariance between a_t and b_t were performed for several values of the smooth parameter λ, considering a process under the

in-control null hypothesis. The simulation yielded values very close to zero for the $cov(a_t, b_t)$. These results suggest that the covariance $cov(a_t, b_t)$ can be considered negligible if the there is no trend, that is, the slope $b_t = 0$. Nevertheless, For $t = 1$, Brown (1962) gives the asymptotic covariance of $Cov(a_t, b_t)$:

$$Cov(a_t, b_t) = \frac{\lambda^2(1 + 3(1 - \lambda))}{(1 + (1 - \lambda))^3}\sigma^2 \tag{3.12}$$

Substituting equations (3.4), (3.8) and (3.12) in equation (3.11) it is possible to obtain the asymptotic variance of the F_t as:

$$Var_{asym}(F_t) = \frac{\lambda(1 + 4(1 - \lambda) + 5(1 - \lambda)^2)}{(1 + (1 - \lambda))^2}\sigma^2 + \frac{2\lambda^3}{(1 + (1 - \lambda))^3}\sigma^2 + \frac{\lambda^2(1 + 3(1 - \lambda))}{(1 + (1 - \lambda))^3}\sigma^2 \tag{3.13}$$

Then, for large values of i the control limits and the center line for the F_t control chart become:

$$UCL = \mu_0 + k\sigma\sqrt{\frac{\lambda(1 + 4(1 - \lambda) + 5(1 - \lambda)^2)}{(1 + (1 - \lambda))^2} + \frac{2\lambda^3}{(1 + (1 - \lambda))^3} + \frac{\lambda^2(1 + 3(1 - \lambda))}{(1 + (1 - \lambda))^3}},$$

$$CL = \mu_0,$$

$$LCL = \mu_0 - k\sigma\sqrt{\frac{\lambda(1+4(1-\lambda)+5(1-\lambda)^2)}{(1+(1-\lambda))^2}+\frac{2\lambda^3}{(1+(1-\lambda))^3}+\frac{\lambda^2(1+3(1-\lambda))}{(1+(1-\lambda))^3}}. \quad (3.14)$$

Design of Double Exponentially Weighted Moving Average Based on Linear Prediction Control Chart F_t

The design parameters for this chart are constructed with k times the multiple of sigma, the standard deviation used in the control limits, and the value of λ, the smooth parameter. It is possible to choose these parameters to give an average performance of average run length (ARL_0) under the null hypothesis (H_0) for a certain number. For example, it is common to use an $ARL_0 = 370$ that is equivalent to an ARL_0 of a Shewhart control chart under H_0 for 3σ as control limits that give us a probability of $\frac{1}{\alpha} = \frac{1}{0.0027}$, to obtain a false alarm given that the process is in-control. In the same manner, the DEWMABLP can be designed to obtain an $ARL_0 = 373 \approx 370$. This value is obtained with $k = 2.16$ and $\lambda = 0.10$.

Assessing Performance of Double Exponentially Weighted Moving Average Based on a Linear Prediction

In order to assess the performance of this new chart, its performance will be compared with the performance of the EWMA, DEWMA, and Shewhart control charts.

A Monte Carlo simulation with 10,000 replications will be done to compare the performance of EWMA, DEWMA, DEWMABLP, Shewhart, and DEWMABLP control charts. In order to be fair when comparing the performance of these control charts, all control limits will be setup to an average run length in-control of $ARL_0 \approx 370$. Next, the

ARL under linear drift (ARL_1) for several slopes will be simulated, that is, the out-of-control will be compared between all these control charts through theirs ARL_1. The control chart with the smallest ARL_1 will be considered the control chart with the best performance.

The simulation will be done using R Software (2014). A series of x_t for $i = 1,2,\dots,100$ observation will be created, such that x_t is independent and identically distributed, without loss of generally, as $x_t \sim N(\mu_0 = 0, \sigma = 1)$, and then another sequence of x_t will be added such that x_t for $i = 101,\dots,200$ observation, where $X_t \sim N(\mu_0 = 0 + \beta t, \sigma = 1)$. This procedure will be repeated several times for several values of the slope β. The values of the slope that will be used correspond to those values that have been reported the literature review presented in Chapter II and will serve to compare the performance of the new chart. These values are 0, 0.025, 0.05, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.75 and 1.

Afterwards, all the ARL_1 obtained with the simulation for the different control charts with the same random variables simulated for x_i will be tabulated in tables to show the behavior of the new control chart. The ARL_1 for each control chart will be compared with the new DEWMABLP control chart to answer the research questions. Additionally, the comparisons between the DEWMABLP control charts and the Fahmy and Elsayed (FE) Chi-squared control chart and the Generalized likelihood ratio (GLR) control chart for drift will be done using the information reported in the literature. That is, a simulation of the DEWMABLP control chart, with equal ARL_1 to the GLR control chart, will be compared versus the ARL_1 reported in the GLR control chart literature Knoth (2012, pp

63-64). In the same manner, the comparison between the Fahmy and Elsayed (FE) Chi-squared control chart and the DEWMABLP control chart will be done.

Then, a conclusion will be issued and discussions will be drawn. Also, advantages and disadvantages of the new control chart will be described. Finally, it will be presented a real numerical example of the new control chart.

CHAPTER IV

RESULTS

In this chapter, first the results of the parameters design for all the control charts under study are presented. This is made in order to be able to compare the control charts in an adequate way. Once the parameters of the control chart have been designed, the performance under each linear drift condition ($\alpha + \beta x$) for several slope values was examined. Next, for each slope value of the linear drift condition, the best control chart was identified. The criterion to select the best control chart was to observe the performance of control chart in terms of the smallest average run length under a linear drift (ARL_1). That is, which control chart detected faster the out-control condition. Finally, the new DWEMABLP control chart was assessed under various shift conditions in order to know how this control chart performs.

Design Parameters for Exponentially Weighted Moving Average, Double Exponentially Weighted Moving Average, and Double Exponentially Weighted Moving Average Based on Linear Prediction Control Charts

To obtain the appropriate k value for each control chart under study, a Monte Carlo simulation with 10,000 replications was run under each in-control condition. In order to be fair, all control charts were setup such that each had an Average in-control Run Length (ARL_0) ≈ 370. Table 4.1 shows the k values needed to obtain an Average Run Length (ARL_0) approximately equally to 370 for EWMA, DEWMA and DEWMABLP (a_t, b_t and F_t) control charts. The values of λ that were considered are:

0.0005, 0.001, 0.005, 0.001, 0.05, 0.01, 0.05, 0.1, 0.2, 0.3 and 0.5. Also, the standard deviation (*SD*) and the standard error (*SE*) of ARL_0 are displayed.

Table 4.1

Average Run Length Under H_o for Several Lambda to Find the Approximate k to Achieve an Average In-Control Run Length ≈ 370

Control chart	Lambda	*k*	ALR_0	*SD*(ARL_0)	SE(ARL_0)
EWMA	0.0005	1.390	369.9	364.9	3.649
EWMA	0.001	1.471	373.0	381.0	3.810
EWMA	0.005	1.781	372.5	401.5	4.015
EWMA	0.01	1.979	372.1	366.1	3.661
EWMA	0.05	2.492	370.4	364.4	3.644
EWMA	0.1	2.703	370.8	392.8	3.928
EWMA	0.2	2.860	370.5	382.5	3.825
EWMA	0.3	2.930	373.7	367.7	3.677
EWMA	0.5	2.977	372.0	362.0	3.620
DEWMA	0.0005	0.772	371.4	385.4	3.854
DEWMA	0.001	0.841	367.2	360.2	3.602
DEWMA	0.005	1.106	368.9	365.9	3.659
DEWMA	0.01	1.294	370.1	371.1	3.711
DEWMA	0.05	1.918	369.7	368.7	3.687
DEWMA	0.1	2.220	370.5	386.5	3.865
DEWMA	0.2	2.52	370.3	389.3	3.893
DEWMA	0.3	2.693	370.9	361.9	3.619
DEWMA	0.5	2.888	370.6	391.6	3.916
at	0.0005	0.505	369.4	370.4	3.704
at	0.001	0.686	370.9	366.9	3.669
at	0.005	1.225	374.0	388.0	3.880
at	0.01	1.446	370.4	382.4	3.824
at	0.05	1.891	370.7	380.7	3.807
at	0.1	2.041	370.1	373.1	3.731
at	0.2	2.180	370.6	368.6	3.686
at	0.3	2.280	371.7	383.7	3.837
at	0.5	2.446	371.2	363.2	3.632
bt	0.0005	0.791	369.9	371.9	3.719
bt	0.001	1.057	371.0	370.0	3.700
bt	0.005	1.800	372.5	386.5	3.865
bt	0.01	2.100	372.0	377.0	3.770
bt	0.05	2.690	371.5	371.5	3.715
bt	0.1	2.845	369.6	395.6	3.956
bt	0.2	2.947	370.8	400.8	4.008
bt	0.3	2.975	370.1	370.1	3.701
bt	0.5	2.996	371.7	385.7	3.857
Ft	0.0005	0.504	370.0	400.0	4.000
Ft	0.001	0.679	368.6	391.6	3.916
Ft	0.005	1.221	372.4	362.4	3.624
Ft	0.01	1.456	369.6	384.6	3.846
Ft	0.05	1.923	370.0	369.0	3.690
Ft	0.1	2.105	370.9	379.9	3.799
Ft	0.2	2.322	370.0	389.0	3.890
Ft	0.3	2.498	372.0	374.0	3.740
Ft	0.5	2.829	370.8	365.8	3.658

The values of Table 4.1 were obtained using a program in R-software checking test-error sequence to find an ARL approximately equal to 370. These programs can be found in Appendix A.

Comparing the Performance of the Control Charts

The average run length under linear drift (ARL_1) with all the λ values considered for several slopes between 0.001 and 3.0 as out-of-control conditions were simulated. The control chart with the smallest out-of-control ARL_1 for each slope of the out-control condition was considered the best control chart for that slope value.

The simulation was made using a program in an R-software that can be consulted in Appendix A. It was created by a stream of X_t for t = 1,2,…,100 observations, such that X_t are independent and identically distributed as $X_t \sim N(\mu_0 = 0, \sigma = 1)$, and then a subsequent stream X_t was added such that of X_t for $t = 101, \ldots, 200$ observations where $X_t \sim N(\mu_0 = 0 + \beta t\sigma, \sigma = 1)$. This procedure was repeated 10,000 times, as it was mentioned above, using values between 0.0005 and 3 for the slope β.

Once the ARL_1s under linear drift were obtained for each slope, the ARLs under each linear drift were sorted from the smallest to the greatest value, and the control chart with the smallest ARL was identified. For example, the Table 4.2 shows $ARL_1(s)$ sorted by ARL_1 for the slope $= 0.001$, it can be observed in this table that the control chart with the smallest ARL_1 is the Double Exponentially Weighted Moving Average based on a Linear Prediction F_t control chart with parameter $\lambda = 0.0005$. The $ARL_1 = 221.12$.

Table 4.2
Average Run Length Under Linear Drift

	Chart	ARL1	*SD*	Lambda
1	Ft	221.12	102.9	0.0005
2	at	221.42	102.7	0.0005
3	Ft	223.05	101.3	0.0010
4	bt	223.18	101.2	0.0005
5	at	223.96	100.5	0.0010
6	bt	227.00	97.7	0.0010
7	DEWMA	240.87	83.3	0.0100
8	Ft	241.44	81.7	0.0050
9	at	242.14	80.9	0.0050
10	bt	247.28	73.6	0.0050
11	DEWMA	248.19	73.1	0.0050
12	EWMA	248.93	71.4	0.0050
13	Ft	251.04	67.6	0.0100
14	at	251.19	67.3	0.0100
15	bt	251.77	66.2	0.0100
16	EWMA	251.97	66.2	0.0100
17	DEWMA	252.98	64.4	0.0500
18	EWMA	255.48	59.2	0.2000
19	DEWMA	256.10	58.3	0.1000
20	EWMA	256.54	57.2	0.0500
21	Ft	256.67	56.8	0.1000
22	Ft	256.78	56.6	0.2000
23	DEWMA	256.89	56.5	0.2000
24	at	257.29	55.5	0.2000
25	at	257.60	54.9	0.1000
26	DEWMA	257.65	54.8	0.3000
27	Ft	257.68	54.7	0.0500
28	bt	257.71	54.7	0.0500
29	EWMA	257.82	54.5	0.1000
30	at	257.85	54.4	0.0500
31	bt	257.91	54.3	0.1000
32	DEWMA	258.27	53.4	0.5000
33	Shewhart	258.47	52.9	0.0010
34	Ft	258.54	52.8	0.3000
35	EWMA	258.59	52.8	0.5000
36	Shewhart	258.59	52.8	0.0500
37	Shewhart	258.64	52.7	0.5000
38	Shewhart	258.69	52.6	0.2000
39	Shewhart	258.80	52.2	0.1000
40	EWMA	258.81	52.3	0.3000
41	Shewhart	258.90	52.0	0.0100
42	Shewhart	259.13	51.6	0.0050
43	at	259.15	51.6	0.5000
44	Shewhart	259.17	51.4	0.3000
45	bt	259.24	51.3	0.2000
46	bt	259.29	51.2	0.5000
47	Shewhart	259.33	51.1	0.0005
48	bt	259.50	50.7	0.3000
49	at	259.52	50.6	0.3000
50	EWMA	263.13	42.0	0.0010
51	EWMA	268.56	19.4	0.0005
52	Ft	269.77	7.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

From Table 4.2, it can be observed that the ARL_1 for the DEWMA CC with $\lambda = 0.01$ is equal to 240.87, for the EWMA CC with $\lambda = 0.005$ is equal to 248, and for the F_t control chart the ARL_1 is equal to 221, meaning that the F_t control chart with parameter $\lambda = 0.0005$ signals faster the out-of-control condition, in average 22 runs quicker than the EWMA CC or DEWMA CC do.

Appendix B contains 60 tables similar to the Table 4.2 for slope values of 0.001, 0.005, values from 0.01 to 0.30 with a skip of a hundredth, 0.35, 0.40, 0.45, 0.50, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, 0.90, 1.00, 1.05, 1.10, 1.15, 1.20, 1.25, 1.30, 1.40, 1.50, 1.60, 1.70, 1.80, 1.90, 2.00, 2.50, and 3.00.

Table 4.3 shows a summary of the best performance control charts by slope for each of the 60 tables of the Appendix B as well as their ARL_1, their standard deviations of the ARL_1, their lambda parameters, and their corresponding slope (Tables B1 are for the first simulation and Tables B2 are for second simulation). Figure 4.1 shows the ARL_1, for F_t, a_t, b_t, EWMA, DEWMA and Shewhart control charts for slopes from 0.0001 to 3. Figures 4.2 to 4.7 show the same information for different zooms for the axis slope.

Table 4.3
Best Performance Control Charts by Slope

Chart	ARL1	*SD*	Lambda	Slope
Ft	221.12	102.93	0.0005	0.001
Ft	219.26	104.15	0.0005	0.005
Ft	213.06	107.99	0.0010	0.01
Ft	171.92	121.22	0.0500	0.02
at	88.65	109.75	0.0500	0.03
at	37.93	62.78	0.0500	0.04
at	20.82	21.88	0.0500	0.05
at	17.31	7.74	0.0500	0.06
EWMA	15.58	5.12	0.2000	0.07
EWMA	14.28	4.09	0.2000	0.08
EWMA	13.26	3.70	0.2000	0.09
EWMA	12.45	3.42	0.2000	0.10
EWMA	11.75	3.19	0.2000	0.11
EWMA	11.06	3.01	0.2000	0.12
EWMA	10.53	2.83	0.2000	0.13
EWMA	10.10	2.68	0.2000	0.14
EWMA	9.67	2.52	0.2000	0.15
EWMA	9.30	2.43	0.2000	0.16
EWMA	8.99	2.29	0.2000	0.17
EWMA	8.72	2.24	0.2000	0.18
EWMA	8.43	2.14	0.2000	0.19
EWMA	8.11	2.05	0.2000	0.20
EWMA	7.94	1.97	0.2000	0.21
EWMA	7.69	1.93	0.2000	0.22
EWMA	7.49	1.86	0.2000	0.23
EWMA	7.27	1.83	0.2000	0.24
EWMA	7.10	1.78	0.2000	0.25
EWMA	6.97	1.71	0.2000	0.26
EWMA	6.77	1.69	0.2000	0.27
EWMA	6.67	1.67	0.3000	0.28
at	6.51	1.64	0.2000	0.29
at	6.37	1.61	0.2000	0.30
at	5.80	1.41	0.2000	0.35
Ft	5.33	1.32	0.2000	0.40
Ft	4.97	1.19	0.2000	0.45
Ft	4.64	1.13	0.2000	0.50
EWMA	4.37	1.11	0.5000	0.55
Ft	4.16	0.99	0.2000	0.60
EWMA	3.91	0.98	0.5000	0.65
Ft	3.74	0.93	0.3000	0.70
EWMA	3.60	0.89	0.5000	0.75
at	3.45	0.84	0.3000	0.80
EWMA	3.32	0.81	0.5000	0.85
EWMA	3.19	0.78	0.5000	0.90
Ft	2.98	0.72	0.3000	1.00
EWMA	2.91	0.70	0.5000	1.05
EWMA	2.82	0.69	0.5000	1.10
EWMA	2.75	0.66	0.5000	1.15
at	2.68	0.69	0.5000	1.20
at	2.62	0.66	0.5000	1.25
at	2.54	0.65	0.5000	1.30
at	2.42	0.62	0.5000	1.40
at	2.33	0.59	0.5000	1.50
at	2.21	0.57	0.5000	1.60
at	2.13	0.54	0.5000	1.70
at	2.06	0.51	0.5000	1.80
at	2.00	0.49	0.5000	1.90
at	1.94	0.46	0.5000	2.00
Shewhart	1.70	0.50	0.0010	2.50
Shewhart	1.49	0.51	0.0005	3.00

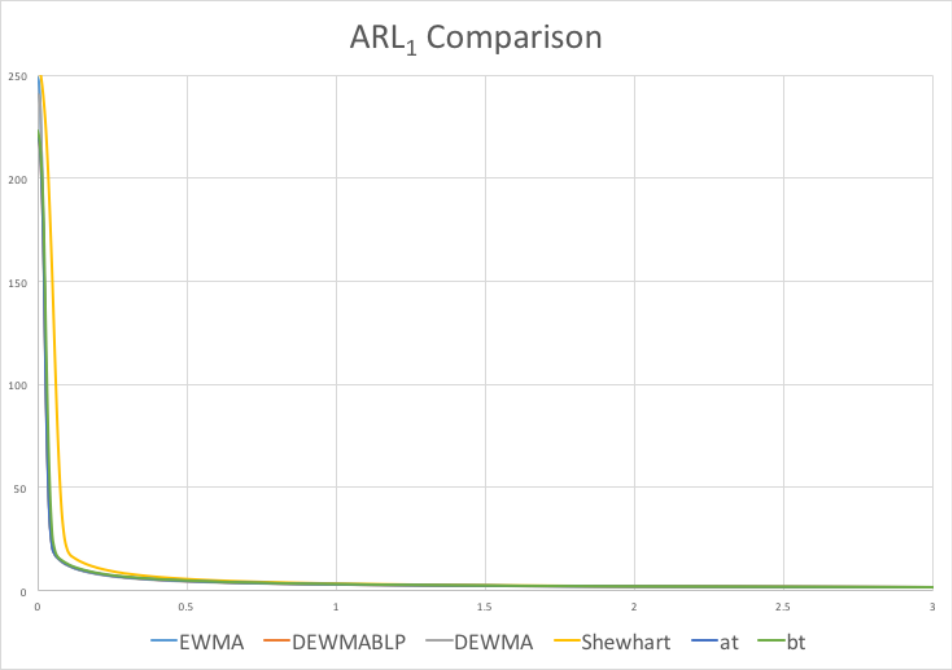

Figure 4.1. Average running length under linear drift comparison versus slope for control charts under study.

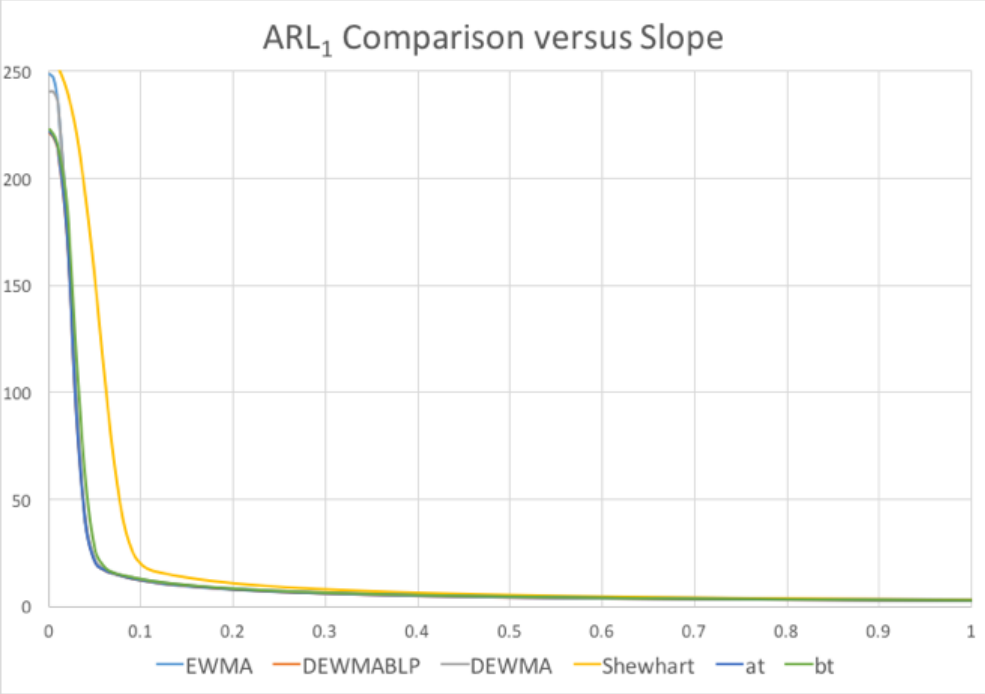

Figure 4.2. Average running length under linear drift comparison versus slope between 0 and 1.

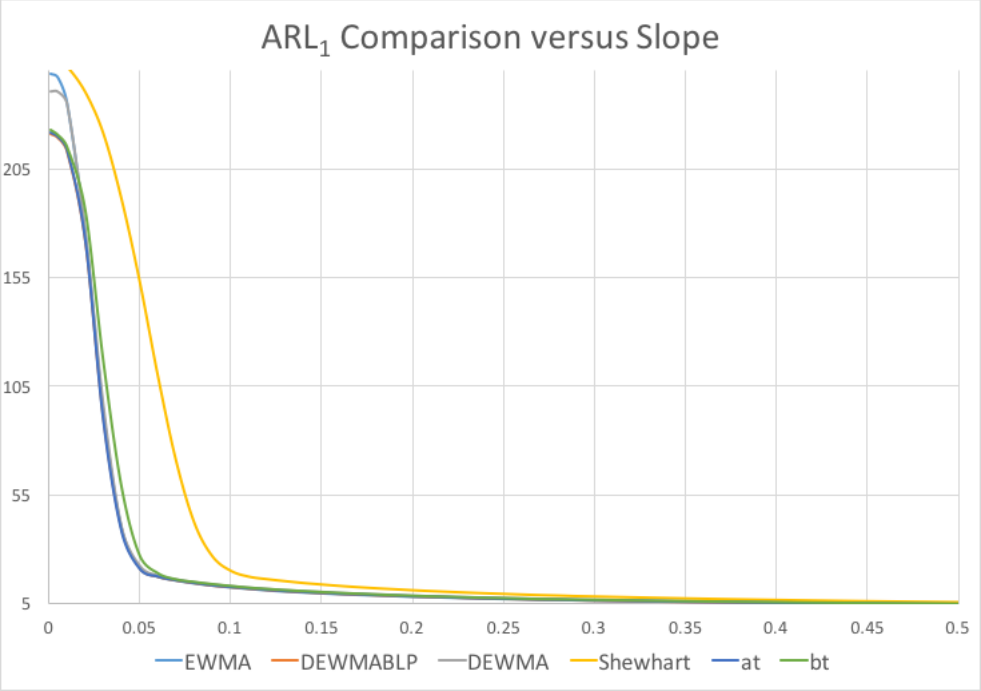

Figure 4.3. Average running length under linear drift comparison versus slope between 0 and 0.5.

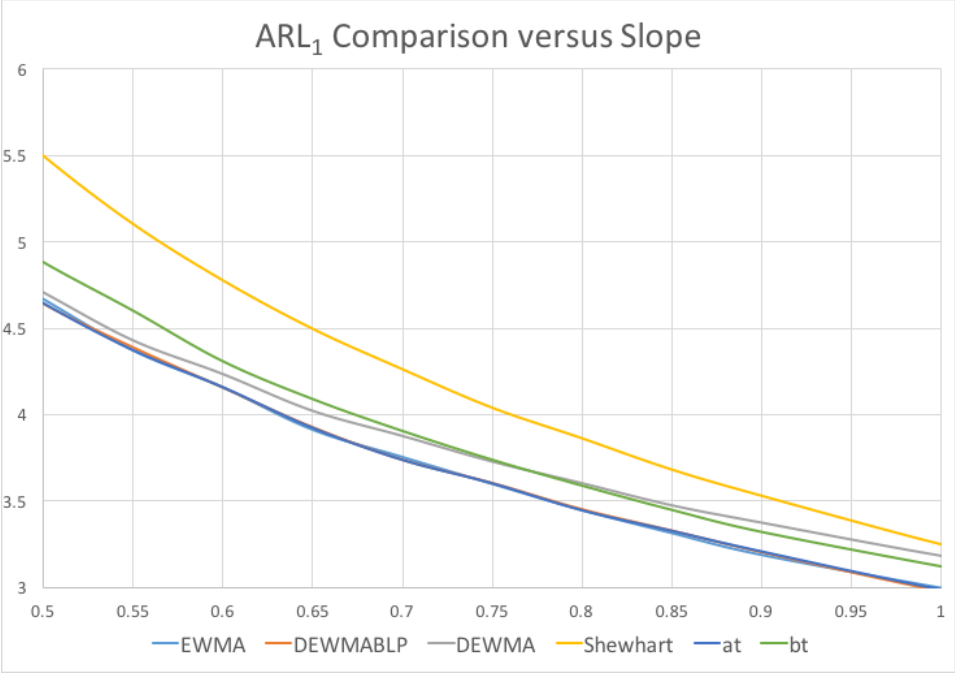

Figure 4.4. Average running length under linear drift comparison versus slope between 0.5 and 1.

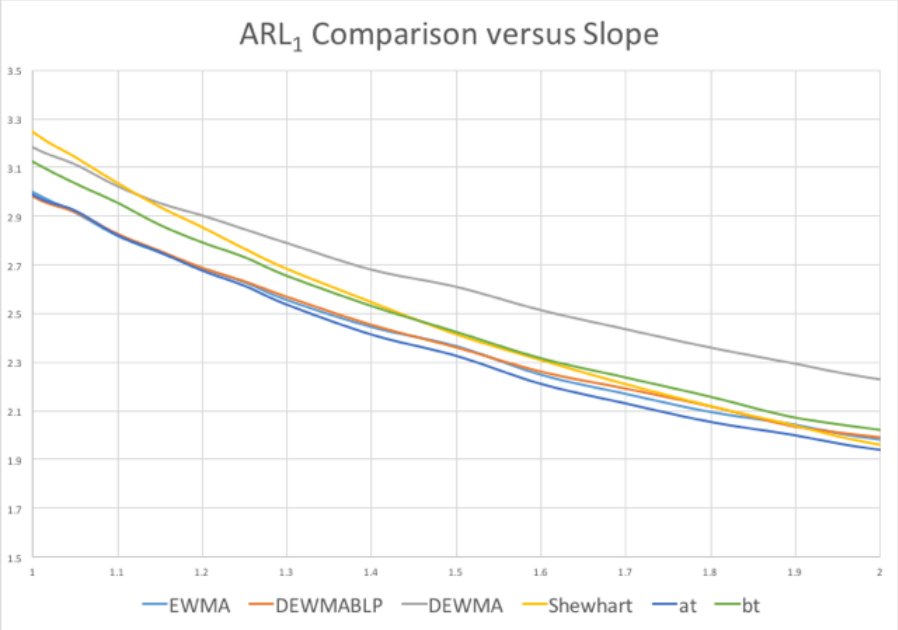

Figure 4.5. Average running length under linear drift comparison versus slope between 1 and 2.

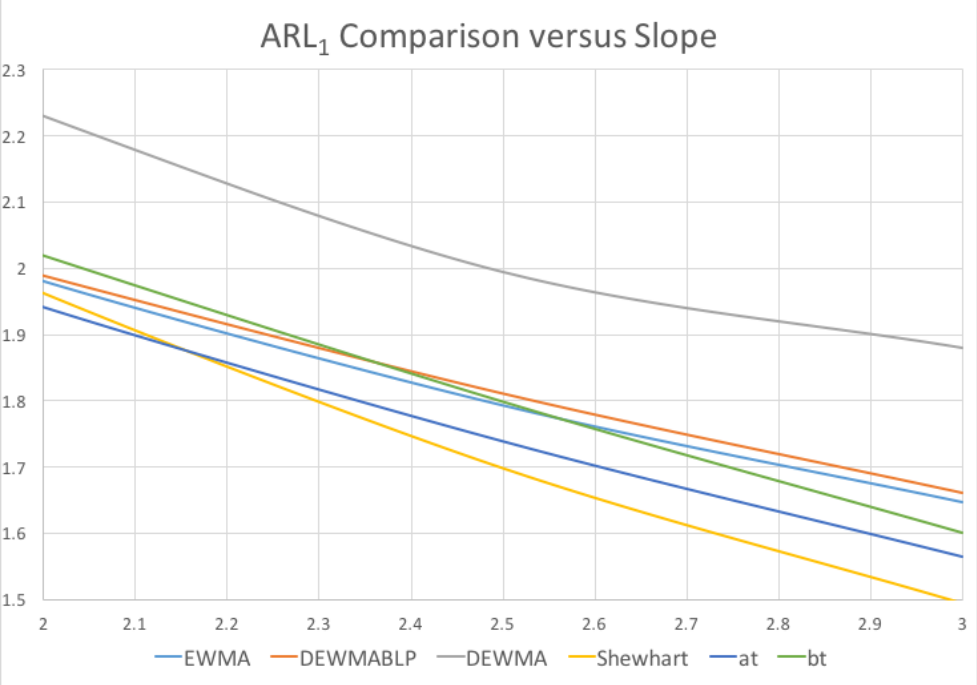

Figure 4.6. Average running length under linear drift comparison versus slope between 2 and 3.

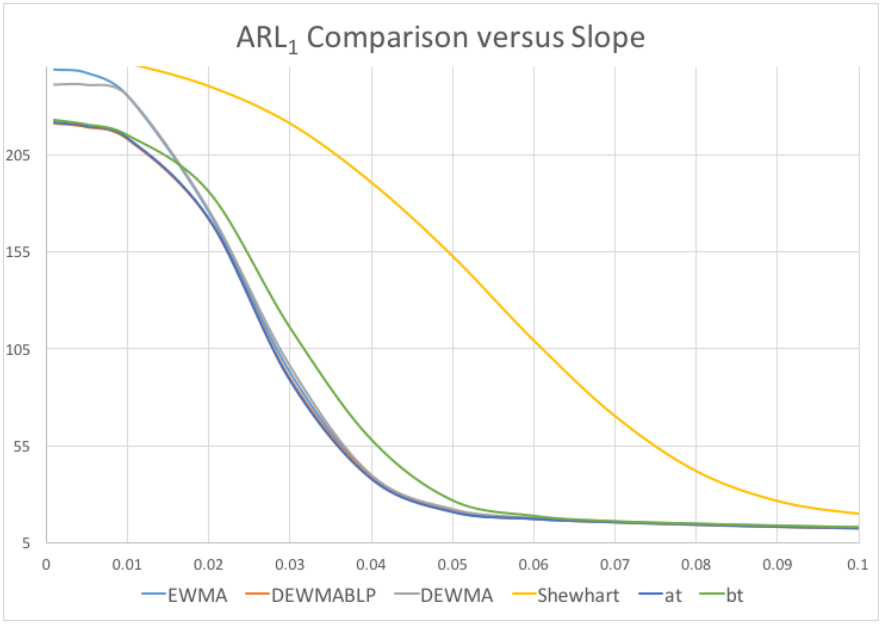

Figure 4.7. Average running length under linear drift comparison versus slope between 0 and 0.5.

It is observed in Figures 4.2 and 4.7 and in Table 4.3 that control charts DEWMABLP F_t and a_t, with their corresponding parameters, have lower $ARL_1 s$ for slopes between 0.001 and 0.06 including the endpoints. The EWMA control chart has better performance with its corresponding parameters, with lower ARL_1 values for slopes between 0.07 and 0.28. For slope values between 0.29 and 0.5 it is not clear which control chart has better performance, because the control charts with lower ARL values are intermixed in this range of slope values. For slope values between 1.2 and 2.0, the control chart a_t has the best performance; and finally, the Shewhart's control chart has the best performance for slope values between 2.5 and 3.0 including the endpoints.

It was decided to run again a new 10,000 replications in order to research the behavior of the performance of these control chart in a deeper manner for slope values between 0.29 and 0.5. Table 4.4 shows a summary of the second simulation, the previous simulation is also included in Table 4.4, in order to make it easier to contrast.

Table 4.1

Best Performance Control Charts by Slope First and Second Simulation

Chart	ARL1	*SD*	Lambda	Slope	Chart	ARL1	*SD*	Lambda	Slope
Ft	221.12	102.93	0.0005	0.001	Ft	222.41	101.8	0.0005	0.001
Ft	219.26	104.15	0.0005	0.005	Ft	217.15	105.8	0.0005	0.005
Ft	213.06	107.99	0.0010	0.01	Ft	211.19	109.5	0.0005	0.01
Ft	171.92	121.22	0.0500	0.02	Ft	173.07	121.0	0.0500	0.02
at	88.65	109.75	0.0500	0.03	at	91.21	111.1	0.0500	0.03
at	37.93	62.78	0.0500	0.04	at	37.78	62.7	0.0500	0.04
at	20.82	21.88	0.0500	0.05	at	20.90	22.1	0.0500	0.05
at	17.31	7.74	0.0500	0.06	Ft	17.44	8.9	0.0500	0.06
EWMA	15.58	5.12	0.2000	0.07	EWMA	15.55	5.8	0.2000	0.07
EWMA	14.28	4.09	0.2000	0.08	EWMA	14.20	4.1	0.2000	0.08
EWMA	13.26	3.70	0.2000	0.09	EWMA	13.24	3.7	0.2000	0.09
EWMA	12.45	3.42	0.2000	0.10	EWMA	12.45	3.4	0.2000	0.10
EWMA	11.75	3.19	0.2000	0.11	EWMA	11.74	3.2	0.2000	0.11
EWMA	11.06	3.01	0.2000	0.12	EWMA	11.09	3.0	0.2000	0.12
EWMA	10.53	2.83	0.2000	0.13	EWMA	10.58	2.8	0.2000	0.13
EWMA	10.10	2.68	0.2000	0.14	EWMA	10.09	2.7	0.2000	0.14
EWMA	9.67	2.52	0.2000	0.15	EWMA	9.68	2.5	0.2000	0.15
EWMA	9.30	2.43	0.2000	0.16	EWMA	9.34	2.4	0.2000	0.16
EWMA	8.99	2.29	0.2000	0.17	EWMA	8.95	2.4	0.2000	0.17
EWMA	8.72	2.24	0.2000	0.18	EWMA	8.66	2.2	0.2000	0.18
EWMA	8.43	2.14	0.2000	0.19	EWMA	8.36	2.1	0.2000	0.19
EWMA	8.11	2.05	0.2000	0.20	EWMA	8.17	2.1	0.2000	0.20
EWMA	7.94	1.97	0.2000	0.21	EWMA	7.90	2.0	0.2000	0.21
EWMA	7.69	1.93	0.2000	0.22	EWMA	7.66	1.9	0.2000	0.22
EWMA	7.49	1.86	0.2000	0.23	EWMA	7.50	1.9	0.2000	0.23
EWMA	7.27	1.83	0.2000	0.24	EWMA	7.29	1.8	0.2000	0.24
EWMA	7.10	1.78	0.2000	0.25	EWMA	7.14	1.8	0.2000	0.25
EWMA	6.97	1.71	0.2000	0.26	DEWMA	6.96	1.8	0.5000	0.26
EWMA	6.77	1.69	0.2000	0.27	EWMA	6.77	1.7	0.2000	0.27
EWMA	6.67	1.67	0.3000	0.28	EWMA	6.68	1.6	0.2000	0.28
at	6.51	1.64	0.2000	0.29	at	6.50	1.6	0.2000	0.29
at	6.37	1.61	0.2000	0.30	at	6.36	1.6	0.2000	0.30
at	5.80	1.41	0.2000	0.35	DEWMA	5.80	1.4	0.5000	0.35
Ft	5.33	1.32	0.2000	0.40	at	5.33	1.3	0.2000	0.40
Ft	4.97	1.19	0.2000	0.45	EWMA	4.98	1.2	0.3000	0.45
Ft	4.64	1.13	0.2000	0.50	Ft	4.65	1.1	0.2000	0.50
EWMA	4.37	1.11	0.5000	0.55	at	4.35	1.1	0.3000	0.55
Ft	4.16	0.99	0.2000	0.60	at	4.15	1.0	0.3000	0.60
EWMA	3.91	0.98	0.5000	0.65	Ft	3.92	1.0	0.3000	0.65
Ft	3.74	0.93	0.3000	0.70	at	3.75	0.9	0.3000	0.70
EWMA	3.60	0.89	0.5000	0.75	Ft	3.59	0.9	0.3000	0.75
at	3.45	0.84	0.3000	0.80	Ft	3.43	0.8	0.3000	0.80
EWMA	3.32	0.81	0.5000	0.85	Ft	3.33	0.8	0.3000	0.85
EWMA	3.19	0.78	0.5000	0.90	EWMA	3.20	0.8	0.5000	0.90
Ft	2.98	0.72	0.3000	1.00	Ft	2.99	0.7	0.3000	1.00
EWMA	2.91	0.70	0.5000	1.05	EWMA	2.91	0.7	0.5000	1.05
EWMA	2.82	0.69	0.5000	1.10	EWMA	2.83	0.7	0.5000	1.10
EWMA	2.75	0.66	0.5000	1.15	at	2.75	0.7	0.5000	1.15
at	2.68	0.69	0.5000	1.20	at	2.68	0.7	0.5000	1.20
at	2.62	0.66	0.5000	1.25	at	2.60	0.7	0.5000	1.25
at	2.54	0.65	0.5000	1.30	at	2.54	0.6	0.5000	1.30
at	2.42	0.62	0.5000	1.40	at	2.42	0.6	0.5000	1.40
at	2.33	0.59	0.5000	1.50	at	2.31	0.6	0.5000	1.50
at	2.21	0.57	0.5000	1.60	at	2.21	0.6	0.5000	1.60
at	2.13	0.54	0.5000	1.70	at	2.14	0.5	0.5000	1.70
at	2.06	0.51	0.5000	1.80	at	2.07	0.5	0.5000	1.80
at	2.00	0.49	0.5000	1.90	at	1.99	0.5	0.5000	1.90
at	1.94	0.46	0.5000	2.00	at	1.94	0.5	0.5000	2.00
Shewhart	1.70	0.50	0.0010	2.50	Shewhart	1.70	0.5	0.0100	2.50
Shewhart	1.49	0.51	0.0005	3.00	Shewhart	1.49	0.5	0.0005	3.00

Observing Table 4.4, it can be seen for slope values from 0.001 to 0.28 the same pattern in first and second simulation. For values between 0.29 and 1.00 it is not clear which control chart has lower ARL_1. It could be said that the performance of F_t, a_t and EWMA are similar in this last interval.

The Double Exponentially Weighted Moving Average Based on Linear Prediction Versus the Fahmy and Elsayed Chi-Squared Control Chart Under Linear Drift

The performance comparison between the DEWMABLP versus the Fahmy and Elsayed (FE) chi-squared control chart was made by simply taking the ARL_1 shown in Knot (2012, p. 63) and contrasting with the DEWMABLP values obtained in this work. Table 4.5 contains the ARL_1 values of FE control chart, the ARL_1 of the DEWMABLP control chart and the ARL_1 of the EWMA control chart when all these control charts are set to an $ARL_0 \approx 370$ for different slopes.

Table 4.2

Comparison of the Average Running Length Under Linear Drift Values of Fahmy and Elsayed Favorite Schemes (χ^2), the Double Exponentially Weighted Moving Average Based on a Linear Prediction Best Schemes, and Double Exponentially Weighted Moving Average Best Schemes Under Drift

Slope	*FE*	*Ft*	EWMA
0.00	379.138	370.000	370.000
0.10	17.445	**12.555**	12.747
0.25	8.537	**7.160**	7.231
0.50	5.027	**4.643**	4.706
0.75	3.672	3.638	**3.620**
1.00	**2.939**	2.980	3.023
2.00	**1.816**	1.989	2.005

The **bold** values mark the smallest ARL_1 outcomes. As can be seen in Table 4.5, the DEWMABLP control chart performed better for slope values between 0.1 and 0.75. For slopes values of 1 and 2, the FE control char has the smallest ARL_1values.

The Double Exponentially Weighted Moving Average Based on a Linear Prediction Versus the Generalized Likelihood Ratio Control Chart for Drift

The assessment between the DEWMABLP versus the generalized likelihood ratio (GLR) control chart for drift was made by simply taking the ARL_1 shown in (Knot, 2012, p. 64) and comparing with the DEWMABLP values obtained in this work. Table 4.6 contains values of k and λ of the DEWMABLP control chart to obtain an $ARL_0 \approx 1750$.

Table 4.6

Values for the Double Exponentially Weighted Moving Average Based on a Linear Prediction Control Chart to Obtain an Approximate Average Running Length In-Control Conditions Equal to 1750

Lambda	k	ARL
0.0005	0.978	1749.1
0.001	1.225	1751.0
0.005	1.760	1747.4
0.01	1.954	1753.6
0.05	2.326	1742.5
0.1	2.488	1770.8
0.2	2.702	1768.6
0.3	2.885	1752.0
0.5	3.256	1769.7

Table 4.7 shows the ARL_1 values for GLR, DEWMABLP, EWMA, and Shewhart control charts under linear drift. Note that the ARL_0 values were setup to reach a value about 1750. The smallest ARL_1 values are **boldly** written. The ARL_1 values for the control chart F_t were simulated fixing the adequate parameters to obtain an $ARL_0 \approx 1750$. In the same manner, for EWMA control charts, values were simulated to fix

adequate parameters to obtain an $ARL_0 \approx 1750$. The complete ARL_1 of the control charts Shewhart and F_t and its corresponding parameters can be found in Appendix C. Values for Shewhart control chart were fixed taking $k = 3.445$, where $\frac{1/2}{1-\Phi(k)} \approx 1750$, and $\Phi(z)$ is the z^{th} percentile of the normal distribution.

In Table 4.7, it can be observed that for slope values around 0.0005, the DEWMABLP control chart has the best performance according to the smallest ARL_1 criterion. For slope values between 0.001 and 0.5 the EWMA control chart shows better performance. For slope values of 1 and 2 the DEWMABLP overcomes the other three charts. Finally, it is observed that for slopes 3 and 4 the Shewhart control chart has superior performance than the other three control charts.

Table 4.3

Average Running Length In-Control Values for Generalized Likelihood Ratio, Double Exponentially Weighted Moving Average Based on a Linear Prediction, Exponentially Weighted Moving Average, and Shewhart Control Charts Under Linear Drift

Slope	GLR	*Ft*	EWMA	Shewhart
0	1750	1750	1750	1751
0.0005	368	**263**	318	267
0.001	249	262	**215**	267
0.005	95.4	91.5	**83.5**	266.5
0.01	62.0	68.6	**55.7**	265.4
0.05	22.5	32.7	**21.1**	220.7
0.1	14.5	14.3	**13.9**	41.1
0.5	5.18	5.17	**5.09**	6.36
1.0	3.31	**3.30**	3.43	3.71
2.0	2.12	**2.12**	2.32	2.19
3.0	1.72	1.71	1.98	**1.67**
4.0	1.34	1.35	1.83	**1.29**

The Performance of the Double Exponentially Weighted Moving Average Based on a Linear Prediction Control Chart Under Shift Condition

A new question arose in the meantime of evaluating the performance of this new control chart: How is the performance of the DEWMABLP under shift conditions, instead of linear drift? In order to answer this question, it was decided to repeat the simulation with the same conditions, except taking a shift δ instead of a linear drift ($\alpha + \beta t$). In other words, a stream of X_t was created for t = 1,2,…,100 observations, such that X_t are independent and identically distributed as $X_t \sim N(\mu_0 = 0, \sigma = 1)$, and then a subsequent stream X_t is created such that of X_t for $t = 101, \ldots, 200$ observations where $X_t \sim N(\mu_0 = 0 + \delta\sigma, \sigma = 1)$, repeating 10,000 times, using values between 0.0005 and 3 for the shift δ.

Once the ARLs under shift were obtained for each shift δ, the ARLs under each shift were sorted from the smallest to the greatest value, and the control chart with the smallest ARL_1 was identified. Table 4.8 shows ARL_1s sorted from smallest to highest for the shift $\delta = 0.001$. It can be observed in this table that the control chart with the smallest ARL_1 is the F_t control chart with parameter $\lambda = 0.0005$. The $ARL_1 = 223.6$.

Table 4.9 shows a summary of the best performance control charts by shift for each of the 60 tables in Appendix C as well as their ARL_1, their standard deviations of the ARL_1, their lambda parameters, and their corresponding shifts (Tables D3 are for the first simulation and Tables D4 are for the second simulation). It is observed in Table 4.9 that control chart F_t with its corresponding parameter, has a smaller ARL_1 for shifts between 0.001 and 0.28 inclusive. The EWMA and DEWMA control charts have better performance with its corresponding parameters with smaller ARL_1 values for slopes

between 0.29 and 0.75 inclusive. For shifts values between 0.80 and 0.9, the a_t chart has better performance. For shifts values between 1.0 and 1.9, the EWMA and DEWMA control charts have better performance; finally, for shift values between 2.0 and 3.0, it is not clear which control chart performs better.

A new 10,000 replicate simulation was run to research the behavior of the performance of these control in a deeper manner for shifts values. Table 4.10 shows a summary of the second simulation; the previous simulation is also included in Table 4.10.

Table 4.4

Average Run Length Under Shift Equals 0.001

	Chart	ARL1	*SD*	Lambda
1	Ft	223.26	101.2	0.0005
2	at	223.50	100.9	0.0005
3	bt	225.01	99.6	0.0005
4	Ft	225.25	99.4	0.0010
5	at	226.33	98.4	0.0010
6	bt	228.87	96.0	0.0010
7	DEWMA	241.20	82.8	0.0100
8	Ft	243.53	79.2	0.0050
9	at	244.01	78.5	0.0050
10	DEWMA	248.16	73.1	0.0050
11	bt	250.19	69.3	0.0050
12	EWMA	250.96	68.3	0.0050
13	Ft	251.61	66.8	0.0100
14	at	251.67	66.7	0.0100
15	DEWMA	252.44	65.5	0.0500
16	EWMA	252.77	64.9	0.0100
17	bt	253.01	64.2	0.0100
18	DEWMA	256.14	58.3	0.1000
19	EWMA	256.84	56.8	0.0500
20	EWMA	257.06	56.1	0.2000
21	DEWMA	257.11	56.1	0.2000
22	at	258.28	53.7	0.0500
23	Ft	258.36	53.5	0.0500
24	EWMA	258.44	53.2	0.1000
25	bt	258.46	53.0	0.1000
26	DEWMA	258.74	52.5	0.3000
27	Ft	258.85	52.3	0.1000
28	Shewhart	258.95	52.0	0.1000
29	bt	258.95	51.9	0.3000
30	bt	258.98	52.0	0.0500
31	Ft	259.06	51.8	0.2000
32	Ft	259.09	51.6	0.3000
33	Shewhart	259.41	50.9	0.0500
34	Shewhart	259.42	50.9	0.0050
35	bt	259.49	50.8	0.2000
36	Shewhart	259.52	50.7	0.2000
37	at	259.53	50.7	0.1000
38	bt	259.62	50.4	0.5000
39	at	259.65	50.4	0.2000
40	Shewhart	259.71	50.2	0.3000
41	at	259.80	50.0	0.3000
42	Shewhart	259.85	49.9	0.0100
43	Shewhart	259.88	49.9	0.0010
44	EWMA	259.90	49.7	0.3000
45	Shewhart	259.94	49.6	0.5000
46	Shewhart	260.10	49.3	0.0005
47	DEWMA	260.44	48.5	0.5000
48	at	260.91	47.3	0.5000
49	EWMA	261.05	47.0	0.5000
50	EWMA	264.34	38.2	0.0010
51	EWMA	268.80	17.6	0.0005
52	Ft	269.82	6.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table 4.5

Best Performance Control Charts by Shift

Chart	ARL1	*SD*	Lambda	Shift
Ft	223.3	101.2	0.0005	0.001
Ft	221.5	102.7	0.0005	0.005
Ft	221.8	102.5	0.0005	0.01
Ft	221.7	102.4	0.0005	0.02
Ft	221.6	102.6	0.0005	0.03
Ft	220.0	103.7	0.0005	0.04
Ft	219.4	104.1	0.0005	0.05
Ft	218.7	104.6	0.0005	0.06
Ft	215.7	106.9	0.0005	0.07
Ft	216.3	106.4	0.0005	0.08
Ft	215.0	107.3	0.0005	0.09
Ft	216.1	106.4	0.0005	0.10
Ft	212.1	109.2	0.0005	0.11
Ft	212.2	109.1	0.0005	0.12
Ft	211.4	109.5	0.001	0.13
Ft	212.1	109.1	0.0005	0.14
Ft	210.0	110.4	0.0005	0.15
Ft	208.1	111.4	0.001	0.16
Ft	207.1	112.1	0.001	0.17
Ft	206.8	112.1	0.001	0.18
Ft	203.3	114.3	0.0005	0.19
Ft	203.0	114.3	0.0005	0.20
Ft	203.0	114.3	0.0005	0.21
Ft	202.3	114.5	0.001	0.22
Ft	200.5	115.6	0.0005	0.23
Ft	198.1	116.7	0.0005	0.24
Ft	197.7	116.9	0.0005	0.25
Ft	197.0	117.0	0.001	0.26
Ft	192.8	119.2	0.0005	0.27
Ft	192.6	119.2	0.0005	0.28
DEWMA	188.7	117.8	0.10	0.29
EWMA	184.2	119.6	0.05	0.30
DEWMA	162.3	124.5	0.10	0.35
DEWMA	137.2	125.6	0.10	0.40
DEWMA	113.2	122.1	0.10	0.45
DEWMA	92.0	114.9	0.10	0.50
DEWMA	72.2	103.8	0.10	0.55
DEWMA	56.3	91.8	0.10	0.60
EWMA	42.9	79.2	0.05	0.65
EWMA	32.2	65.0	0.05	0.70
DEWMA	24.8	48.7	0.10	0.75
at	19.2	42.1	0.05	0.80
at	15.6	32.3	0.05	0.85
at	13.0	24.0	0.05	0.90
EWMA	10.0	13.1	0.10	1.00
EWMA	9.2	10.1	0.10	1.05
EWMA	8.5	8.5	0.10	1.10
EWMA	7.6	8.9	0.20	1.15
EWMA	7.0	6.5	0.20	1.20
EWMA	6.5	4.4	0.20	1.25
EWMA	6.2	5.6	0.20	1.30
EWMA	5.5	2.8	0.20	1.40
EWMA	5.0	2.5	0.20	1.50
DEWMA	4.5	2.4	0.50	1.60
DEWMA	4.1	2.1	0.50	1.70
DEWMA	3.8	1.8	0.50	1.80
DEWMA	3.5	1.6	0.50	1.90
at	3.3	1.5	0.20	2.00
EWMA	2.4	1.2	0.50	2.50
at	1.8	0.9	0.50	3.00

Table 4.6

Best Performance Control Charts by Shift First and Second Simulation

	First simulation				Second Simulation				
Chart	ARL1	*SD*	Lambda	Shift	Chart	ARL1	*SD*	Lambda	Shift
Ft	223.3	101.2	0.0005	0.001	Ft	224.2	100.5	0.0005	0.001
Ft	221.5	102.7	0.0005	0.005	Ft	222.6	101.8	0.0005	0.005
Ft	221.8	102.5	0.0005	0.01	Ft	222.0	102.1	0.0005	0.01
Ft	221.7	102.4	0.0005	0.02	Ft	221.7	102.4	0.0005	0.02
Ft	221.6	102.6	0.0005	0.03	Ft	219.0	104.6	0.0005	0.03
Ft	220.0	103.7	0.0005	0.04	Ft	219.7	104.0	0.0005	0.04
Ft	219.4	104.1	0.0005	0.05	at	218.2	105.1	0.0005	0.05
Ft	218.7	104.6	0.0005	0.06	at	219.9	103.7	0.0005	0.06
Ft	215.7	106.9	0.0005	0.07	Ft	216.0	106.7	0.0005	0.07
Ft	216.3	106.4	0.0005	0.08	Ft	216.4	106.4	0.0005	0.08
Ft	215.0	107.3	0.0005	0.09	Ft	215.9	106.5	0.0010	0.09
Ft	216.1	106.4	0.0005	0.10	Ft	216.0	106.5	0.0005	0.10
Ft	212.1	109.2	0.0005	0.11	Ft	214.4	107.6	0.0005	0.11
Ft	212.2	109.1	0.0005	0.12	Ft	212.6	108.7	0.0010	0.12
Ft	211.4	109.5	0.0010	0.13	Ft	211.3	109.6	0.0010	0.13
Ft	212.1	109.1	0.0005	0.14	Ft	211.2	109.6	0.0010	0.14
Ft	210.0	110.4	0.0005	0.15	Ft	207.4	112.1	0.0005	0.15
Ft	208.1	111.4	0.0010	0.16	Ft	208.3	111.5	0.0005	0.16
Ft	207.1	112.1	0.0010	0.17	at	207.8	111.7	0.0005	0.17
Ft	206.8	112.1	0.0010	0.18	Ft	207.8	111.5	0.0010	0.18
Ft	203.3	114.3	0.0005	0.19	Ft	205.7	112.9	0.0005	0.19
Ft	203.0	114.3	0.0005	0.20	Ft	203.7	114.0	0.0005	0.20
Ft	203.0	114.3	0.0005	0.21	Ft	202.8	114.4	0.0005	0.21
Ft	202.3	114.5	0.0010	0.22	Ft	202.6	114.2	0.0010	0.22
Ft	200.5	115.6	0.0005	0.23	Ft	198.1	116.9	0.0005	0.23
Ft	198.1	116.7	0.0005	0.24	Ft	197.8	116.9	0.0005	0.24
Ft	197.7	116.9	0.0005	0.25	Ft	198.0	116.7	0.0005	0.25
Ft	197.0	117.0	0.0010	0.26	Ft	194.9	118.0	0.0010	0.26
Ft	192.8	119.2	0.0005	0.27	Ft	194.7	118.1	0.0010	0.27
Ft	192.6	119.2	0.0005	0.28	Ft	191.3	119.8	0.0005	0.28
DEWMA	188.7	117.8	0.10	0.29	DEWMA	187.6	118.2	0.10	0.29
EWMA	184.2	119.6	0.05	0.30	EWMA	183.1	119.9	0.05	0.30
DEWMA	162.3	124.5	0.10	0.35	EWMA	162.5	124.8	0.05	0.35
DEWMA	137.2	125.6	0.10	0.40	DEWMA	139.3	125.7	0.10	0.40
DEWMA	113.2	122.1	0.10	0.45	DEWMA	114.5	122.4	0.10	0.45
DEWMA	92.0	114.9	0.10	0.50	EWMA	91.6	115.4	0.05	0.50
DEWMA	72.2	103.8	0.10	0.55	DEWMA	73.8	105.2	0.10	0.55
DEWMA	56.3	91.8	0.10	0.60	DEWMA	55.2	90.5	0.10	0.60
EWMA	42.9	79.2	0.05	0.65	EWMA	42.3	78.5	0.05	0.65
EWMA	32.2	65.0	0.05	0.70	at	32.5	66.9	0.05	0.70
DEWMA	24.8	48.7	0.10	0.75	EWMA	24.6	51.3	0.05	0.75
at	19.2	42.1	0.05	0.80	EWMA	19.3	40.0	0.05	0.80
at	15.6	32.3	0.05	0.85	EWMA	15.6	33.3	0.10	0.85
at	13.0	24.0	0.05	0.90	at	13.0	24.3	0.05	0.90
EWMA	10.0	13.1	0.10	1.00	at	10.1	11.7	0.05	1.00
EWMA	9.2	10.1	0.10	1.05	EWMA	9.2	10.7	0.10	1.05
EWMA	8.5	8.5	0.10	1.10	DEWMA	8.4	11.0	0.30	1.10
EWMA	7.6	8.9	0.20	1.15	EWMA	7.6	9.3	0.20	1.15
EWMA	7.0	6.5	0.20	1.20	EWMA	7.1	8.0	0.20	1.20
EWMA	6.5	4.4	0.20	1.25	EWMA	6.5	5.1	0.20	1.25
EWMA	6.2	5.6	0.20	1.30	EWMA	6.2	4.2	0.20	1.30
EWMA	5.5	2.8	0.20	1.40	EWMA	5.5	2.9	0.20	1.40
EWMA	5.0	2.5	0.20	1.50	DEWMA	5.0	2.8	0.50	1.50
DEWMA	4.5	2.4	0.50	1.60	DEWMA	4.5	2.4	0.50	1.60
DEWMA	4.1	2.1	0.50	1.70	DEWMA	4.2	2.1	0.50	1.70
DEWMA	3.8	1.8	0.50	1.80	DEWMA	3.8	1.8	0.50	1.80
DEWMA	3.5	1.6	0.50	1.90	DEWMA	3.5	1.6	0.50	1.90
at	3.3	1.5	0.20	2.00	at	3.3	1.5	0.20	2.00
EWMA	2.4	1.2	0.50	2.50	EWMA	2.4	1.2	0.50	2.50
at	1.8	0.9	0.50	3.00	at	1.8	0.9	0.50	3.00

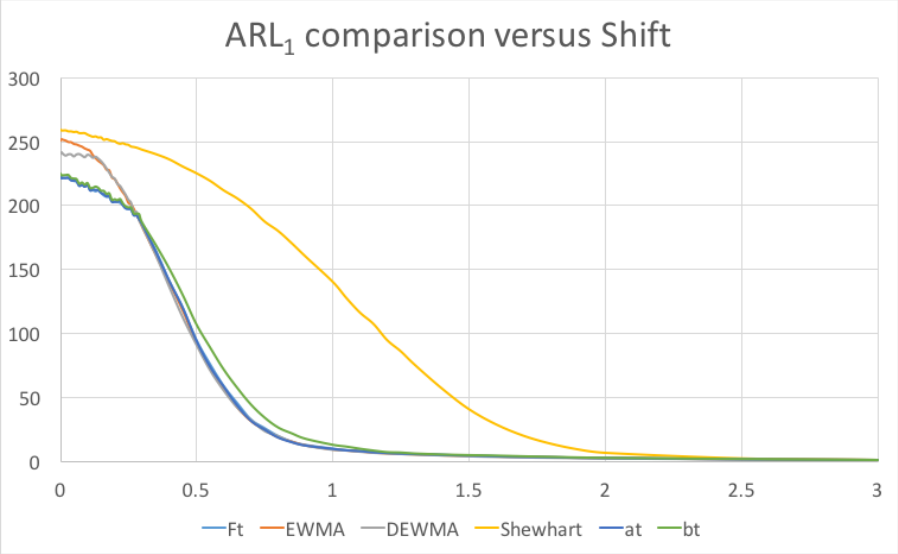

Figure 4.8. Average running length in-control comparison versus shifts between 0 and 3.

Observing Table 4.10 and Figure 4.8, it can be seen the same pattern in first and second simulation. For shifts values between 0.001 and 0.29 it is clear that the F_t control chart has the best performance. For shifts values between 0.30 and 3, it can be seen that the a_t, EWMA and DEWMA control charts take turns intermixing in having the smallest ARL_1. Note that for a_t control chart with parameter lambda equal to 0.20, for shift = 3.0, has an $ARL_1 = 1.8$ overcome all control charts, even though the Shewhart control chart which has an $ARL_1 = 2.0$ for a shift = 3.0 (see Appendix B, tables B3-60 and B4-60).

Numeric Examples of the New Double Exponentially Weighted Moving Average Based on a Linear Prediction

Figure 4.9 shows a numeric example for DEWMABLP F_t applied to 20 observations of simulated data when process is in-control with mean equal to 50 and standard deviation equal to 1.86. The DEWMABLP control chart in this case has a lambda parameter equal to 0.1.

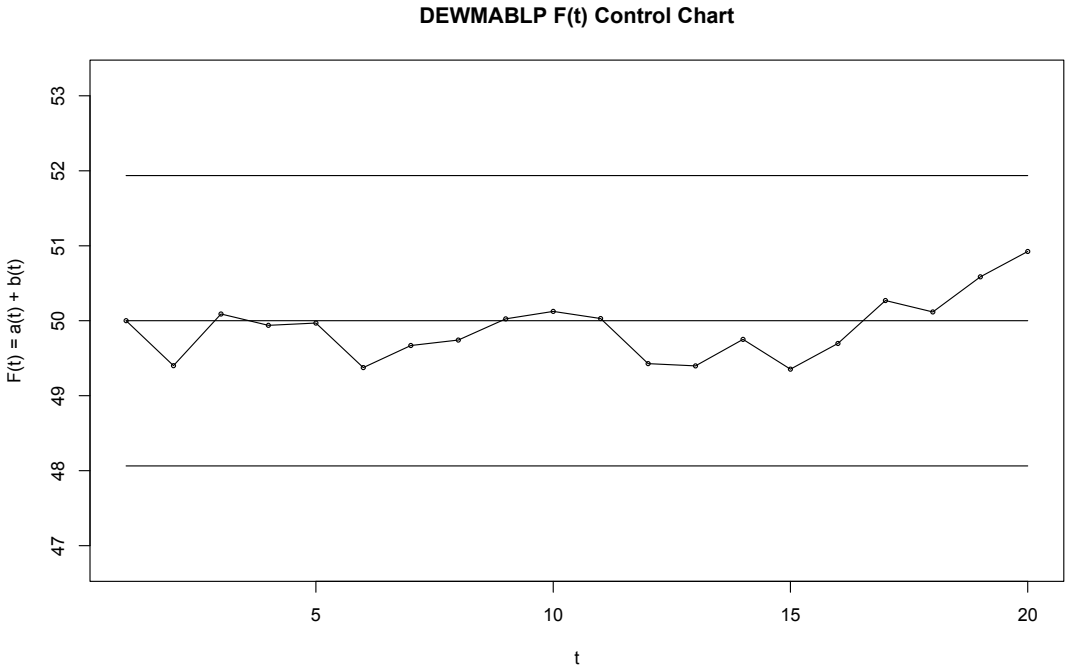

Figure 4.9. Double exponentially weighted moving average based on a linear prediction F(t) control chart with 20 observations.

The Figure 4.10 shows a plot with 44 observations; the first 20 observations are the same data of the Figure 4.9 and the last four observations are a simulate linear trend sequence with slope of 0.2. In this example, it can be observed an out-of-control signal for observations 23 and 24. Also, the lambda parameter for the DEWMABLP is 0.1.

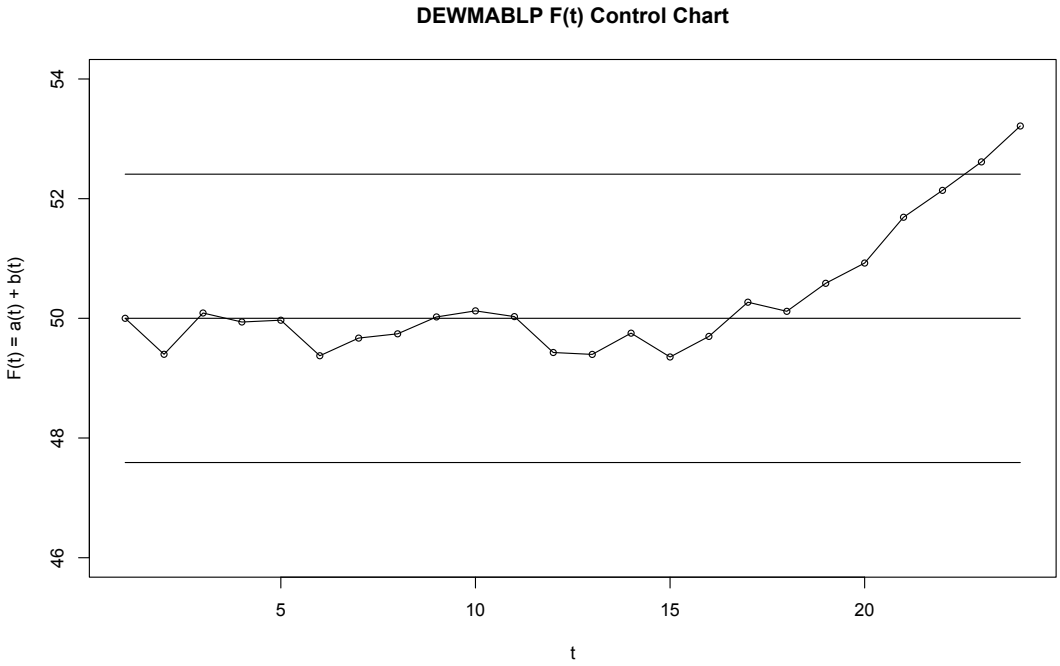

Figure 4.10. Double exponentially weighted moving average based on a linear prediction F(t) control chart with 44 observations.

For the next example, data from the Example 6.1 of Montgomery (2007) were taken. Figure 4.11 shows a control chart for the b_t (slope) of the DEWMABLP with 45 observations of the third sample of the Wafers from the Hard-Bake Process example, the b_t DEWMABLP control chart detected an out-in-control condition in observation 44, using only the third sample with a Lambda parameter equal to 0.1. The mean of the five samples of this example was used too in order to build a b_t control chart. In this last example, it can be seen in Figure 4.12 that the b_t control chart detects an out-of-control condition since observation number 41 in contrast to the Shewhart classical control chart which was observed on number 43.

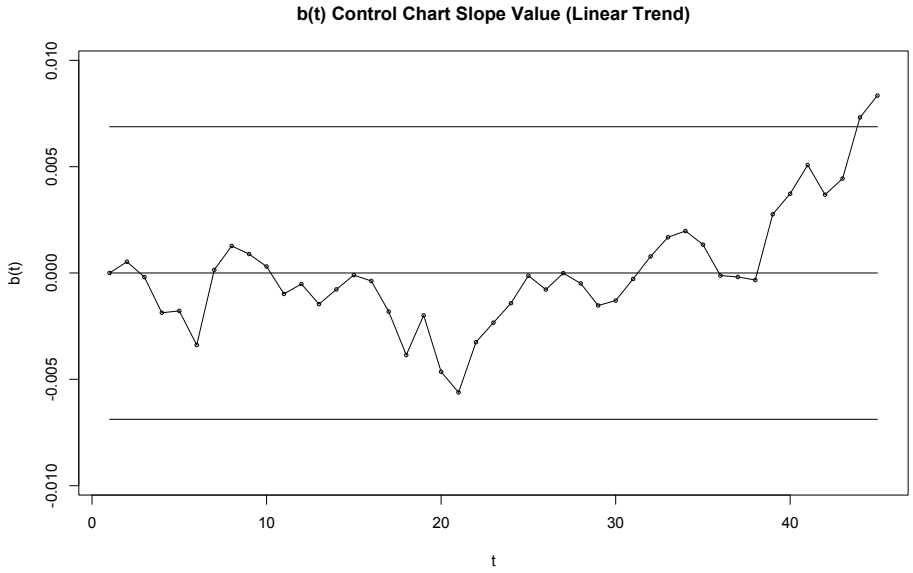

Figure 4.11. The b(t) control slope value (linear trend) with 45 observations.

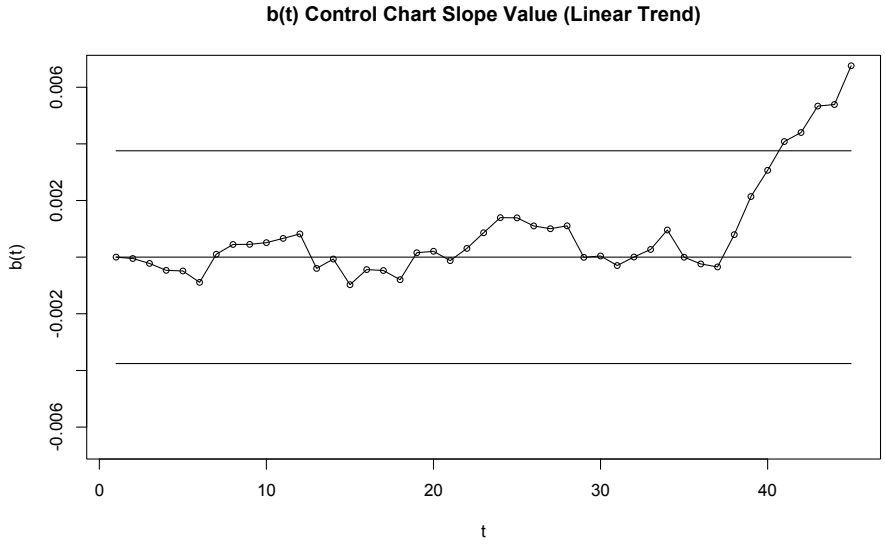

Figure 4.12. The b(t) control slope value (linear trend).

CHAPTER V

CONCLUSIONS AND FURTHER CONSIDERATIONS

Firstly, it can be concluded that the new DEWMABLP control chart (CC) can be used to detect linear drift process using the adequate parameters to detect linear trends in the cases where a small linear trend is presented. Specifically, for slope values between 0.001 and 0.06 times the standard deviation with its corresponding suitable parameters, this new DEWMABLP control chart performs better, in this range, than the other control charts considered in this study. The EWMA control chart also performed well but with an ARL_1 slightly higher than DEWMABLP for slope values in the same range. The EWMA control chart works better for slope values between 0.07 and 0.28 and for slope values around 1.0 times the standard deviation. The DEWMABLP control chart also performed well, but with an ARL_1 slightly higher than EWMA for slope values in the same range. Conversely, the DEWMA control chart showed a poor performance in contrast to DEWMABLP and the EWMA control charts for all slope values considered in this study. That is, for slopes for values between 0.001 and 3.

Secondly, considering comparing the new DEWMABLP control chart versus the EWMA, DEWMA, GLR and FH control charts, the conclusion is that the DEWMABLP with minor lambdas (0.001 - 0.0005) parameters works better to detect small slopes (0.001 to 0.06) quicker than the EWMA, DEWMA, GLR and FH control charts under linear drift. Also, the DEWMABLP F_t and a_t overcome the EWMA, DEWMA, GLR and

FH control charts under linear drift for slope values between 1.0 and 2.0. However, as it was mentioned, the EWMA overcomes the performance of the DEWMABLP control chart for slope values between 0.07 and 0.28. Nevertheless, for values between 0.29 and 0.5 it is not clear which control chart has a better performance, therefore, it is not clear what chart has the best performance.

In addition, the a_t control chart can be used to detect drift conditions, and in some cases overcome the performance of the other control charts. Specifically, for slopes values between 1.2 and 2.0 times the standard deviation, the a_t control chart overwhelmed the performance of the EWMA and DEWMA control charts according to the criterion of the ARL_1. However, the Fahmy and Elsayed control chart overcomes the performance of the DEWMABLP control charts for values in this range.

For slope values between 2 and 4 the DEWMABLP chart performs similar than the Generalized Likelihood Ratio control chart and better than the Fahmy and Elsayed and EWMA control charts, but not as good as the classical Shewhart control chart. As it is expected, the Shewhart control charts performs better than all other control charts for values between three and four times the standard deviation.

Thirdly, this new DEWMABLP control chart can be truly user friendly by all quality control engineers, having the advantage of also being easy to set up according to the drift that the practitioner would like to detect it in its process. This can be done using the information from Table 4.3 by selecting the desired drift from the table and taking the accurate Lambda parameter from Table 4.1. The numeric load to build this new DEWMABLP control chart is similar to the construction of DEWMA control chart; being

of great help since you do not have to use any other resources to implement this new DEWMABLP control chart.

Fourthly, while studying this new DEWMABLP control chart to detect linear drift, it was discovered that it cannot only be used to detect linear drifts but also the new DEWMABLP control chart can perform very well to detect small classical shifts. This discovery led to research deeper in this matter, showing that the new DEWMABLP control chart also can detect much faster an out-in-control condition than classical control charts do for small values. Specifically, the DEWMABLP F_t performs well detecting small shift values between 0.001 and 0.28, overcoming all other typical control charts in this slopes range. It is clear that the new DEWMABLP chart is an alternative to be used in conditions where it is important to early detection small shifts or drifts by quality control departments in industry or service companies. Keeping in mind that it is always a good practice to have a set of several control charts to monitor large deviation as well as short shifts or drifts of the mean level, there will never be only one control chart that will always detect all possible kinds of shift and drift.

Following the same path as for the drifts, the new DEWMABLP has the same advantages of being a control chart that can be easily customized according to the shifts that the user desires to detect in its pursuit of out-of-control. This can be done using the information from Table 4.9 by selecting the desire shift from the table and taking the accurate Lambda parameter from Table 4.1. The numeric calculation will be the same as to the process to detect a linear drift.

Regarding future research on this matter, several important topics could be considered. Firstly, it will be interesting to know how sensitive the new control charts are

to non-normal distribution behavioral, that is, how does the new DEWMABLP control chart perform under non-normal conditions? For example, the t-student, the log-normal, the Weibull or other skewed distribution. Secondly, how does the new DEWMABLP proposed control chart work when the sample size is greater than one, for both normal and non-normal distributions. Next, it will be exciting to try to use another linear prediction methodology to build the forecast F_t of the new chart, in other words, build the liner prediction function $F_t = a_t + b_t t$, with other than the Brown's shooting forecast method estimation of a_t and b_t. For example, to predict F_t the Holt's smoothing prediction method can be used (Holt, 2004) or a different kind of forecast method used to predict linear trends. Also, it may be interesting to extend or develop this control chart to detect an alternative kind of drift, like a quadratic drift or another functional form. In the same manner, it will be interesting to investigate how this new DEWMABLP control chart performs when the variance change is presented in a process. Finally, it will be essential to apply this DEWMABLP control chart to some real data in manufacturing industries and administrative companies in order to observe its behavior, it might be significant to control the deviation from an industrial process or to control the deviation from a budget of a finances process.

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APPENDIX A

R-CODES USED FOR SIMULATION

A.1 CALCULATE THE ARL_0 FOR F(T) DEWMABLP CONTROL CHART FOR INDIVIDUALS

```
#########################################################################
 ########################
# Ft DEWMABLP
# Calculate the ARL0 for DEWMABLP Control Chart for the individuals
# Try several values for K and Lambda

#Initial values
lambda = 0.025
k1 = 1.898
n = 50
nn = 50
m = 1
mm = m
mu = 0
stdev = 1

slope = 0        # For ARL0 slope = 0
c = 1            # c = the sample size, in the case of individuals c - 1

# Mod Fuction is used to print every l observations
mod<-function(x,m)
 {
  t1<-floor(x/m)
  return(x-t1*m)
 }

#####################################################
# Create First n - m values normally distributed with
# mu = mu and standard deviation = stdev add the last m
# values with values of mu + slope*(n-m) with normally
# distributed error N(mu, stdev)

trend <- c(rep(0, n))  #
i <- 1:n
for (j in 1:n)    {
       if (j > n - m)
       trend[j] = (j - (n - m)) * slope
             }
#####################################################
# Create a Function with 10000 replications for ARL0 #

ARL0 <- function (n = nn, m = mm, k1, lambda, c = 1)
 {
 trend <- c(rep(0, n))

 xx <- c(rep(mu, (n - m) * c)) + rnorm((n-m)*c,mean = 0, sd = stdev)

 xxx <- c(rep(mu, m * c))+rnorm(c*m,mean = 0, sd = stdev)
```

```
A1 = matrix(xx, nrow = n - m, ncol = c)
A2 = matrix(xxx, nrow = m, ncol = c)

B1 = apply(A1, 1, mean)
B2 = apply(A2, 1, mean)

x <- c(B1, B2) + trend

# initial values for S and SP (simple an double exponential weighted moving average)
S <- c(rep(mu, 1), rep(0, n - 1))
SP <- c(rep(mu, 1), rep(0, n - 1))

# calculate the S EWMA
for (j in 2:n) S[j] = lambda * x[j] + (1 - lambda) * S[j - 1]
#S

# Calculate the Double EWMA (DEWMA)
for (j in 2:n) SP[j] = lambda * S[j] + (1 - lambda) * SP[j - 1]
#SP

########## Calculate at and bt(i)      ##############
at = 2 * S - SP
bt = (lambda/(1-lambda))*(S-SP)

########## Calculate Var(at) and Var(bt) ##############
var_at<-numeric() # Initialite var at
var_bt<-numeric() # Initialite var bt
for (i in 1:n)
      {
      var_at[i] = (lambda*(1+4*(1-lambda)+5*(1-lambda)^2) /(1+(1-lambda))^2)
      var_bt[i] = ((2*lambda^3)/(1+(1-lambda))^3)
      }


######## Calculate Ft and Var(Ft) ###################

Ft=at+bt
sigma = stdev/sqrt(c)
sigma2 = sqrt(stdev/c)
  var_Ft = sigma2*(var_at + var_bt + (lambda^2)*(1+3*(1-lambda))/(1+(1-lambda))^3)

#################################################
#   Calculate the standard deviation for at, bt and Ft
  sd_at = sqrt(var_at)
  sd_bt = sqrt(var_bt)
  sd_Ft = sqrt(var_Ft)

#   Fix the Upper, Central and Lower control limits ##
UCL <- mu + k1*sd_Ft
```

```
 CL <- rep(mu, n)
 LCL <- mu - k1*sd_Ft

#########   Find the Run Length ######################
 ARLinControl <- rep(n, n)  # initialite
 stop = 0
 j = 0
 for (j in 1:n)
   {
      if ((Ft[j] > UCL[j]) + (Ft[j] < LCL[j]))
       {
            ARLinControl[j] = j
            break
       }
    }
#########   Calculate the Average Run Length ######
 ARL0 = ARLinControl[j]
 }

################################################
# End of function ARL0
################################################

######    RESULTS        ########################
# K1 = 0.504 lambda = 0.0005 ARL0 = 370.0
# K1 = 0.679 lambda = 0.001  ARL0 = 368.6
# K1 = 1.221 lambda = 0.005  ARL0 = 372.4
# K1 = 1.456 lambda = 0.01   ARL0 = 369.6
# K1 = 1.923 lambda = 0.05   ARL0 = 370.0
# K1 = 2.105 lambda = 0.10   ARL0 = 370.9
# K1 = 2.322 lambda = 0.20   ARL0 = 370.0
# K1 = 2.498 lambda = 0.3    ARL0 = 372.0
# K1 = 2.829 lambda = 0.5    ARL0 = 370.8
################################################


################################################
n = 10000        # Number of replicates
lambda = 0.0005   # Lambda value to test
k1 = 0.504       # K value to test
A <- numeric()
B <- numeric()

for (I in 1:10000)
 {
 A[I] = ARL0(n = n, m = 1, k1 = k1, lambda = lambda, c = 1)
 B[I]=mean(A)
 if (mod(I,500)==0)
 {
  cat("iteration = ", I ,"  mean = ",mean(A),"  sd = ",sd(A),"    max = ",max(A)," min =
```

```
 ",min(A),"\n")
   }
  }
mean(A)
sd(A)
max(A)

#########################################################################
```

A.2 CALCULATE THE ARL_0 FOR DEWMA CONTROL CHART FOR INDIVIDUALS

```
#########################################################################
 ####################

# ARL for DEWMA Control Chart
# Initial values
lambda = 0.05
n = 5000
m = 1
mm = m
mu = 10
stdev = 1
slope = 0          # TO calculate ARL0 the slope is equal to 0
k = 2.7
k1 = 2.7

# first n - m points have base value of mu w/ normally distributed error,
# last m points have base value of mu + slope*(n-m) w/ normally distributed error
#
trend <- c(rep(0, n))
i <- 1:n
for (j in 1:n)
      {
          if (j > n - m)
       trend[j] = (j - (n - m)) * slope
      }


##############################################
# Function to create 10000 ARL0
##############################################

ARL0 <- function (n = nn, m = mm, k1, lambda)
 {
 trend <- c(rep(0, n))

 xx <- c(rep(mu, (n - m) * 5)) + rnorm((n - m)*5, mean = 0, sd = stdev)
 xxx <- c(rep(mu, m * 5)) + rnorm(m*5, mean = 0, sd = stdev)
```

```
A1 = matrix(xx, nrow = n - m, ncol = 5)
A2 = matrix(xxx, nrow = m, ncol = 5)

B1 = apply(A1, 1, mean)
B2 = apply(A2, 1, mean)

x <- c(B1, B2) + trend

# initial values for S and SP (simple an dowble exponential weighted moving average)
S <- c(rep(mu, 1), rep(0, n - 1))
SP <- c(rep(mu, 1), rep(0, n - 1))

# calculate the S EWMA
for (j in 2:n) S[j] = lambda * x[j] + (1 - lambda) * S[j - 1]
#S

# Calculate the Double EWMA (DEWMA)
for (j in 2:n) SP[j] = lambda * S[j] + (1 - lambda) * SP[j - 1]
#SP

sigma = sd(B1)
sigma2 = var(B1)


################################################
# SIMULATE DEWMA
################################################
LP = (lambda - 1)^2
 #var_SP = sigma2*(lambda*(2-2*lambda+lambda^2))/(2-lambda)^3
 var_SP   = sigma2 * (lambda^4) * ((1 + LP)/(1 - LP)^3)

 sd_SP = sqrt(var_SP)
 UCL <- rep(mu + k1 * sd_SP, n)
 CL <-    rep(mu, n)
 LCL <-  rep(mu - k1 * sd_SP, n)

 maxSP = mu + 5 * sd_SP
 minSP  = mu -  5 * sd_SP
 i <- 1:n


 ARLinControl <- rep(n, n)
 stop = 0
 j = 0
 for (j in 1:n)
        {
       if ((SP[j] > UCL[j]) + (SP[j] < LCL[j]))
                {
              ARLinControl[j] = j
              break
```

```
            }
        }

 ARL0 = ARLinControl[j]
 ARLinControl[j]
 ARL0
}
#############     End SIMULATE ############################


###################### RESULTS ########################
# k = 1.390,  lambda = 0.0005, ARL0 = 369.9
# k = 1.4705, lambda = 0.001,  ARL0 = 373.0
# k = 1.781,  lambda = 0.005,  ARL0 = 372.5
# k = 1.979,  lambda = 0.01,   ARL0 = 372.1
# k = 2.492,  lambda = 0.05,   ARL0 = 370.4
# k = 2.703,  lambda = 0.10,   ARL0 = 370.8
# k = 2.860,  lambda = 0.20,   ARL0 = 370.5
# k = 2.930,  lambda = 0.30,   ARL0 = 373.7
# k = 2.977,  lambda = 0.50,   ARL0 = 372.0
#########################################################



number = 6000
replicate = 10000
lambda =
k = 2.977

A <- rep(0, 10)

A <- rep(0, 10)

for (I in 1: replicate) {
 A[I] = ARL0(n = number,m = 1, k1 = k, lambda = lambda)

 if (mod(I,500)==0)
  {
 cat("iteration = ", I ,"  mean = ",mean(A),"   sd = ",sd(A),"     max = ",max(A),"       min =
 ",min(A),"\n")
    }
}
mean(A)
sd(A)
max(A)

#########################################################################
```

A.3 CALCULATE THE ARL_0 FOR EWMA CONTROL CHART FOR INDIVIDUALS

```
#############################################################################
 ##########
# ARL for EWMA Control Chart for the individuals
# Initial values
lambda = 0.1
n = 3000
mu = 0
stdev = 1
k = 2.7
c = 1
mod<-function(x,m)
 {
  t1<-floor(x/m)
  return(x-t1*m)
 }

###############################################
# Function to create 10000 ARL
###############################################

ARL0 <- function (n, k, lambda, c)
{
stdev = 1

xx <-c(rep(mu, n * c) + rnorm(n*c,mean = 0, sd = stdev))

A1 = matrix(xx, nrow = n, ncol = c)
B1 = apply(A1, 1, mean)
x = B1

# initial values for S  (simple exponential weighted moving average)
S <- c(rep(mu, 1), rep(0, n - 1))

# calculate the S EWMA
for (j in 2:n) S[j] = lambda * x[j] + (1 - lambda) * S[j - 1]
#S

sigma = stdev/sqrt(c)
sigma2 = stdev/c


###############################################
# SIMULATE EWMA
###############################################
i <- 1:n

var_S <-c(rep(0, n))
sd_S <-c(rep(0, n))
```

```
for (i in 1:n)
    {
   var_S[i] = sigma2 * (lambda/(2-lambda))*(1 - (1-lambda)^(2*i))
     sd_S[i] = sqrt(var_S[i])
    }

 UCL <- mu + k*sd_S
 CL <- rep(mu, n)
 LCL <- mu - k*sd_S

 ARLinControl <- rep(n,n)

 for (j in 1:n)
    {
        if ((S[j] > UCL[j]) + (S[j] < LCL[j]))
        {
             ARLinControl[j] = j
             break
         }
    }

 ARL0 = ARLinControl[j]
}


################################################
# End of function ARL0
################################################


################ RESULTS ######################
# k = 1.39,   lambda = 0.0005,   ARL0 = 369.9
# k = 1.4705, lambda = 0.001,   ARL0 = 373.0
# k = 1.781,  lambda = 0.005,    ARL0 = 372.5
# k = 1.979,  lambda = 0.01,     ARL0 = 372.1
# k = 2.492,  lambda = 0.05,     ARL0 = 370.4
# k = 2.703,  lambda = 0.10,     ARL0 = 370.8
# k = 2.860,  lambda = 0.20,     ARL0 = 370.5
# k = 2.930,  lambda = 0.30,     ARL0 = 373.7
# k = 2.977,  lambda = 0.50,     ARL0 = 372.0
################################################
# Begin simulation
number = 5000
replicate = 10000
lambda = 0.50
k = 2.977
A <- rep(0, 10)

for (l in 1: replicate)
```

```
  {
  A[l] = ARL0(n = number, k = k, lambda = lambda, c = 1)
  if (mod(l,500)==0)
    {
       cat("iteration = ", l ," mean = ",mean(A),"   sd = ",sd(A),"     max = ",max(A),"
      min = ",min(A),"\n")
      }
   }
mean(A)
sd(A)
max(A)

# End simulation
#########################################################################
```

A.4 CALCULATE THE ARL$_0$ FOR A(T) DEWMABLP CONTROL CHART FOR INDIVIDUALS

```
#########################################################################
 ####
# ARL for at DEWMABLP Control Chart for individuals
# Initial values
lambda = 0.025
n = 50
nn = 50
m = 1
mm = m
mu = 0

stdev = 1
slope = 0
k =  1.898
k1 = 1.898
c = 1

# first n - m points have base value of mu w/ normally distributed error,
# last m points have base value of mu + slope*(n-m) w/ normally distributed error
#
trend <- c(rep(0, n))
i <- 1:n
for (j in 1:n) {
 if (j > n - m)
       trend[j] = (j - (n - m)) * slope
}


#############################################
# Function to create 10000 ARL
#############################################
```

```
ARL0 <- function (n = nn, m = mm, k1, lambda, c = 1)
 {
  var_SP = 0
  var_s = 0
  A <- rep(0, 10)
  var_at<-rep(0,10)
  var_bt<-rep(0,10)

for (i in 1:n)
       {
        var_at[i] = (lambda*(1+4*(1-lambda)+5*(1-lambda)^2) /(1+(1-lambda))^2)
        var_bt[i] = ((2*lambda^3)/(1+(1-lambda))^3)
        }

  trend <- c(rep(0, n))
 xx <- c(rep(mu, (n - m) * c)) + rnorm((n-m)*c,mean = 0, sd = stdev)
 xxx <- c(rep(mu, m * c))+rnorm(c*m,mean = 0, sd = stdev)
 A1 = matrix(xx, nrow = n - m, ncol = c)
 A2 = matrix(xxx, nrow = m, ncol = c)
 B1 = apply(A1, 1, mean)
 B2 = apply(A2, 1, mean)
 x <- c(B1, B2) + trend

 # initial values for S and SP (simple an dowble exponential weighted moving average)
 S <- c(rep(mu, 1), rep(0, n - 1))
 SP <- c(rep(mu, 1), rep(0, n - 1))

 # calculate the S EWMA
 for (j in 2:n) S[j] = lambda * x[j] + (1 - lambda) * S[j - 1]
 #S

 # Calculate the Double EWMA (DEWMA)
 for (j in 2:n) SP[j] = lambda * S[j] + (1 - lambda) * SP[j - 1]
 #SP

 # Calculate the Ft = at + bt(i)
 at = 2 * S - SP
 bt = (lambda/(1-lambda))*(S-SP)
 sigma = stdev/sqrt(c)
 sigma2 = stdev/c


##############################################
# SIMULATE
##############################################

var_at = var_at*sigma2
var_bt = sigma2*var_bt
sd_at = sqrt(var_at)
sd_bt = sqrt(var_bt)
```

```
 UCL <- mu + k1*sd_at
 CL <- rep(mu, n)
 LCL <- mu - k1*sd_at
 ARLinControl <- rep(n, n)
 stop = 0
 j = 0
 for (j in 1:n)
  {
       if ((at[j] > UCL[j]) + (at[j] < LCL[j]))
       {
             ARLinControl[j] = j
             break
       }
   }

 ARL0 = ARLinControl[j]
}
################################################
# End of function ARL0
################################################


#################### RESULTS ######################
# lambda = 0.0005 k1 = 0.505 ARL0 = 369.4403 rep 10,000
# lambda = 0.001 k1 = 0.686 ARL0 = 370.9 rep 10,000
# lambda = 0.005 k1 = 1.225 ARL0 = 374.0 rep 10,000
# lambda = 0.01  k1 = 1.446 ARL0 = 370.44 rep 5,000
# lambda = 0.05  k1 = 1.891 ARL0 = 370.71 5,000 rep
# lambda = 0.10  k1 = 2.041 ARL0 = 370.08 100,000 rep
# lambda = 0.20  k1 = 2.180 ARL0 = 370.6 10,000 rep
# lambda = 0.30  k1 = 2.280 ARL0 = 371.7 10,000 rep
# lambda = 0.50  k1 = 2.446 ARL0 = 371.2 10,000 rep
################################################

####################Simulation ####################
n = 6000
lambda = 0.001
k1 = 0.505
at
var_SP = 0
var_s = 0
A <- rep(0, 10)

var_at<-rep(0,10)
var_bt<-rep(0,10)

for (i in 1:n)
 {
 var_at[i] = (lambda*(1+4*(1-lambda)+5*(1-lambda)^2) /(1+(1-lambda))^2)
 var_bt[i] = ((2*lambda^3)/(1+(1-lambda))^3)
```

```
}


for (l in 1:10000)
   {
 A[l] = ARL0(n = n, m = 1, k1 = k1, lambda = lambda, c = 1)
   }
mean(A)
sd(A)
max(A)
###################### End of Simulation #################
```

A.5 CALCULATE THE ARL$_0$ FOR B(T) DEWMABLP CONTROL CHART FOR INDIVIDUALS

```
#########################################################################
 ####
# ARL for b(t) DEWMABLP Control Chart for individuals
# Initial values
lambda = 0.025
n = 50
nn = 50
m = 1
mm = m
mu = 0
stdev = 1
slope = 0
k =   1.898
k1 = 1.898
c = 1

# first n - m points have base value of mu w/ normally distributed error,
# last m points have base value of mu + slope*(n-m) w/ normally distributed error
#
trend <- c(rep(0, n))
i <- 1:n
for (j in 1:n) {
 if (j > n - m)
       trend[j] = (j - (n - m)) * slope
}


###############################################
# Function to create 10000 ARL
###############################################

ARL0 <- function(n = nn, m = mm, k1, lambda, c = 1)
 {
 stdev = 1
 trend <- c(rep(0, n))
```

```
xx <- c(rep(mu, (n - m) * c)) + rnorm((n-m)*c,mean = 0, sd = stdev)

xxx <- c(rep(mu, m * c))+rnorm(c*m,mean = 0, sd = stdev)

A1 = matrix(xx, nrow = n - m, ncol = c)
A2 = matrix(xxx, nrow = m, ncol = c)

B1 = apply(A1, 1, mean)
B2 = apply(A2, 1, mean)

x <- c(B1, B2) + trend

var_SP = 0
var_s = 0
A <- rep(0, 10)
var_at<-rep(0,10)
var_bt<-rep(0,10)

for (i in 1:n)
{
var_at[i] = (lambda*(1+4*(1-lambda)+5*(1-lambda)^2) /(1+(1-lambda))^2)
var_bt[i] = ((2*lambda^3)/(1+(1-lambda))^3)
}

# initial values for S and SP (simple an dowble exponential weighted moving average)
S <- c(rep(mu, 1), rep(0, n - 1))
SP <- c(rep(mu, 1), rep(0, n - 1))

# calculate the S EWMA
for (j in 2:n) S[j] = lambda * x[j] + (1 - lambda) * S[j - 1]
#S

# Calculate the Double EWMA (DEWMA)
for (j in 2:n) SP[j] = lambda * S[j] + (1 - lambda) * SP[j - 1]
#SP

# Calculate the Ft = at + bt(i)
at = 2 * S - SP
bt = (lambda/(1-lambda))*(S-SP)

sigma = stdev/sqrt(c)
sigma2 = stdev/c


##############################################
# SIMULATE
##############################################
var_bt = sigma2*var_bt
sd_bt = sqrt(var_bt)
```

```
 UCL <- mu + k1*sd_bt
 CL <- rep(mu, n)
 LCL <- mu - k1*sd_bt
 ARLinControl <- rep(n, n)
 stop = 0
 j = 0
 for (j in 1:n)
   {
      if ((bt[j] > UCL[j]) + (bt[j] < LCL[j])) {
            ARLinControl[j] = j
            break
      }
   }
 ARL0 = ARLinControl[j]
}
################################################
# End of function ARL0
################################################


################# RESULTS ####################
# lambda = 0.0005 k1 = 0.791 ARL0 = 369.9
# lambda = 0.001  k1 = 1.057 ARL0 = 371.0
# lambda = 0.005  k1 = 1.800 ARL0 = 372.5
# lambda = 0.01   k1 = 2.100 ARL0 = 372.0
# lambda = 0.05   k1 = 2.690 ARL0 = 371.5
# lambda = 0.10   k1 = 2.845 ARL0 = 369.6
# lambda = 0.20   k1 = 2.947 ARL0 = 370.8
# lambda = 0.30   k1 = 2.975 ARL0 = 370.1
# lambda = 0.50   k1 = 2.996 ARL0 = 371.7
################################################

# Begin smulation
n = 6000
lambda = 0.30
k1 = 2.975

for (l in 1:10000)
 {
 A[l] = ARL0(n = n, m = 1, k1 = k1, lambda = lambda, c = 1)
 }
mean(A)
sd(A)
max(A)
# End Simulation
################################################
```

A.6 CALCULATE THE ARL1 FOR SEVERAL DISTRIBUTIONS UNDER DRIFT CONDITION

```
#########################################################################
 #####
# Calculate the ARL1 for EWMA, DEWMA, Shewhart and DEWMABLP (F(t), a(t), and
 b(t))
# Initial values
lambda = 0.01
slope = 1.0

############## Create a function ARL1 ##################
ARL = function (lambda = lambda, slope = slope)
{
n = 500
m = 90
mu = 10
stdev = 1

# Setup k values for theris corresponding distribution Lambda's parameters
if (lambda == 0.0005)
{
 k =  1.390 ####  EWMA
 k1 = 0.7723 ####  DEWMA
 k2 = 0.505 ####  at
 k3 = 0.791 ####  bt
 k4 = 0.504 ####  Ft
} else
  if (lambda == 0.001)
{
 k =  1.471 ####  EWMA
 k1 = 0.841 ####  DEWMA
 k2 = 0.686 ####  at
 k3 = 1.057 ####  bt
 k4 = 0.679 ####  Ft
} else
  if (lambda == 0.005)
{
 k =  1.781 ####  EWMA
 k1 = 1.106 ####  DEWMA
 k2 = 1.225 ####  at
 k3 = 1.800 ####  bt
 k4 = 1.221 ####  Ft
} else
  if (lambda == 0.01)
{
 k =  1.979 ####  EWMA
 k1 = 1.294 ####  DEWMA
 k2 = 1.446 ####  at
 k3 = 2.100 ####  bt
 k4 = 1.456 ####  Ft
```

```
} else
  if (lambda == 0.05)
{
 k =  2.492 ####  EWMA
 k1 = 1.918 ####  DEWMA
 k2 = 1.891 ####  at
 k3 = 2.690 ####  bt
 k4 = 1.923 ####  Ft
} else
  if (lambda == 0.10)
{
 k =  2.703 ####  EWMA
 k1 = 2.220 ####  DEWMA
 k2 = 2.041 ####  at
 k3 = 2.845 ####  bt
 k4 = 2.105 ####  Ft
} else
  if (lambda == 0.20)
{
 k =  2.806 ####  EWMA
 k1 = 2.520 ####  DEWMA
 k2 = 2.180 ####  at
 k3 = 2.947 ####  bt
 k4 = 2.322 ####  Ft
} else
  if (lambda == 0.30)
{
 k =  2.930 ####  EWMA
 k1 = 2.693 ####  DEWMA
 k2 = 2.280 ####  at
 k3 = 2.975 ####  bt
 k4 = 2.498 ####  Ft
} else
  if (lambda == 0.50)
{
 k =  2.977 ####  EWMA
 k1 = 2.888 ####  DEWMA
 k2 = 2.446 ####  at
 k3 = 2.996 ####  bt
 k4 = 3.829 ####  Ft
}

# Initialize variables
A1 = 0
A2 = 0
A3 = 0
A4 = 0
A5 = 0
A6 = 0
SD1 = 0
```

```
ARL1 = 0

number = 10000   # Replicates

for (kk in 1:number)
{                                  # Begin for from 1 to number

# first n - m points have base value of mu w/ normally distributed error,
# last m points have base value of mu + slope*i w/ normally distributed error
#
trend <- c(rep(0,n))
i <- 1:n
for (j in 1:n)
{
 if (j > n-m) trend[j] = (j - (n-m))*slope
}

xx <- c(rep(mu, n)) + rnorm(n, mean=0, sd=stdev)
x<-xx + trend    # simulate a trend
# x<-xx + slope      # simulate a Shift

sigma = sd(xx)
sigma2 = var(xx)

# initial values for S and SP (simple an dowble exponential weighted moving average)
S <- c(rep(mu,1),rep(0,n-1))
SP <- c(rep(mu,1),rep(0,n-1))
R <- c(rep(NULL,1),rep(0,n-1))

# calculate the S EWMA
for(j in 2:n)
S[j] = lambda * x[j] + (1 - lambda) * S[j-1]
S

# Calculate the Double EWMA (DEWMA)
for(j in 2:n)
SP[j] = lambda * S[j] + (1 - lambda) * SP[j-1]
SP

##############################################
# Create an individual Shewhart X Chart
##############################################
# calculate the moving R - bar
d2 = 1.128                # From table
for(j in 2:n)
R[j] = abs(xx[j] - xx[j-1]) # movil range
MR = mean(R[-1])
xbar = mean(xx)

UCL <- rep(xbar + 3*(MR/d2),n)
```

```
CL  <- rep(xbar,n)
LCL <- rep(xbar - 3*(MR/d2),n)

i <- 1:n
for (ii in p:n)
{
 if (x[ii] > UCL[ii])
 {
 ARL11 = ii - (n-m)
 break
 }
 ARL11 = n-m
}
################################################
# Ende of Create an individual Shewhart X Chart
################################################


################################################
# Create a EWMA Chart
################################################
var_S = sigma2*(lambda/(2-lambda))
sd_S = sqrt(var_S)

UCL <- rep(mu + k*sd_S,n)
CL  <- rep(mu,n)
LCL <- rep(mu - k*sd_S,n)

i <- 1:n
for (ii in p:n)
{
 if (S[ii] > UCL[ii])
 {
 ARL12 = ii - (n-m)
 break
 }
 ARL12 = n-m
}

################################################
# End of Create a EWMA Chart
################################################


################################################
# Create a DEWMA Chart
################################################
var_SP = sigma2*((lambda*(2-2*lambda+lambda^2)/(2-lambda)^3))
sd_SP = sqrt(var_SP)
UCL <- rep(mu + k1*sd_SP,n)
```

```
CL  <- rep(mu,n)
LCL <- rep(mu - k1*sd_SP,n)

i <- 1:n
for (ii in p:n)
{
 if (SP[ii] > UCL[ii])
 {
 ARL13 = ii - (n-m)
 break
 }
 ARL13 = n - m
}
################################################
# End of Create a DEWMA Chart
################################################

################################################
# Create The lineal trend prediction DEWMABLP at
################################################

at = 2 * S - SP
var_at = sigma2*(4*(lambda/(2-lambda))+lambda*(2-2*lambda+lambda^2)/(2-lambda)^3)
sd_at = sqrt(var_at)

UCL <- rep(mu + k2*sd_at,n)
CL  <- rep(mu,n)
LCL <- rep(mu - k2*sd_at,n)

i <- 1:n
for (ii in p:n)
{
 if (at[ii] > UCL[ii])
 {
 ARL14 = ii - (n-m)
 break
 }
 ARL14 = n-m
}

################################################
# End of Create lineal trend prediction DEWMABLP control charts at
################################################

################################################
# Create lineal trend prediction DEWMABLP control charts bt
################################################
bt = (lambda/(1-lambda))*(S-SP)
var_bt = sigma2*((lambda/(1-lambda))^2)*((lambda/(2-lambda))+lambda*(2-
 2*lambda+lambda^2)/(2-lambda)^3)
```

```
sd_bt = sqrt(var_bt)

bUCL <- rep(0 + k3*sd_bt,n)
bCL  <- rep(0,n)
bLCL <- rep(0 - k3*sd_bt,n)

for (ii in p:n)
{
 if (bt[ii] > bUCL[ii])
 {
 ARL15 = ii - (n-m)
 break
 }
 ARL15 = n - m
}
################################################
# End Create The lineal trend prediction DEWMA control charts bt
################################################

################################################
# Create The lineal trend prediction DEWMA control charts Ft = at + bt
################################################

Ft = at + bt
var_Ft = var_at + var_bt
sd_Ft = sqrt(var_Ft)

FUCL <- rep(mu + k4*sd_Ft,n)
FCL  <- rep(mu,n)
FLCL <- rep(mu - k4*sd_Ft,n)

for (ii in p:n)
{
 if (Ft[ii] > FUCL[ii])
 {
 ARL16 = ii - (n-m)
 break
 }
 ARL16 = n - m
}

################################################
# End Create The lineal trend prediction DEWMA control charts Ft
################################################

# Store values
A1[kk] = ARL11
A2[kk] = ARL12
A3[kk] = ARL13
A4[kk] = ARL14
```

```
A5[kk] = ARL15
A6[kk] = ARL16

}  # End of for


ARL1[1] = mean(A1)
ARL1[2] = mean(A2)
ARL1[3] = mean(A3)
ARL1[4] = mean(A4)
ARL1[5] = mean(A5)
ARL1[6] = mean(A6)


SD1[1] = sd(A1)
SD1[2] = sd(A2)
SD1[3] = sd(A3)
SD1[4] = sd(A4)
SD1[5] = sd(A5)
SD1[6] = sd(A6)



cat(" ","\n",
"0","Chart   ","ARL1","SD1","Lambda","slope","\n",
"1","shewhart",ARL1[1],SD1[1],lambda,slope,"\n",
"2","EWMA    ",ARL1[2],SD1[2],lambda,slope,"\n",
"3","DEWMA   ",ARL1[3],SD1[3],lambda,slope,"\n",
"4","at      ",ARL1[4],SD1[4],lambda,slope,"\n",
"5","bt      ",ARL1[5],SD1[5],lambda,slope,"\n",
"6","Ft      ",ARL1[6],SD1[6],lambda,slope,"\n","\n"
)


} # End of function ARL

sink("/Users/rafael/print.txt")

# lambda = v_lambda
 v_lambda = 0.0005          # Change this value to 0.001, 0.005, 0.01, 0.05, 0.1, 0.2 ,0.3
 and 0.05 for other simulations

ARL(lambda = v_lambda, slope = 0.001)
ARL(lambda = v_lambda, slope = 0.005)
ARL(lambda = v_lambda, slope = 0.01)
ARL(lambda = v_lambda, slope = 0.02)
ARL(lambda = v_lambda, slope = 0.03)
ARL(lambda = v_lambda, slope = 0.04)
ARL(lambda = v_lambda, slope = 0.05)
ARL(lambda = v_lambda, slope = 0.06)
```

```
ARL(lambda = v_lambda, slope = 0.07)
ARL(lambda = v_lambda, slope = 0.08)
ARL(lambda = v_lambda, slope = 0.09)
ARL(lambda = v_lambda, slope = 0.10)
ARL(lambda = v_lambda, slope = 0.11)
ARL(lambda = v_lambda, slope = 0.12)
ARL(lambda = v_lambda, slope = 0.13)
ARL(lambda = v_lambda, slope = 0.14)
ARL(lambda = v_lambda, slope = 0.15)
ARL(lambda = v_lambda, slope = 0.16)
ARL(lambda = v_lambda, slope = 0.17)
ARL(lambda = v_lambda, slope = 0.18)
ARL(lambda = v_lambda, slope = 0.19)
ARL(lambda = v_lambda, slope = 0.20)
ARL(lambda = v_lambda, slope = 0.21)
ARL(lambda = v_lambda, slope = 0.22)
ARL(lambda = v_lambda, slope = 0.23)
ARL(lambda = v_lambda, slope = 0.24)
ARL(lambda = v_lambda, slope = 0.25)
ARL(lambda = v_lambda, slope = 0.26)
ARL(lambda = v_lambda, slope = 0.27)
ARL(lambda = v_lambda, slope = 0.28)
ARL(lambda = v_lambda, slope = 0.29)
ARL(lambda = v_lambda, slope = 0.30)
ARL(lambda = v_lambda, slope = 0.35)
ARL(lambda = v_lambda, slope = 0.40)
ARL(lambda = v_lambda, slope = 0.45)
ARL(lambda = v_lambda, slope = 0.50)
ARL(lambda = v_lambda, slope = 0.55)
ARL(lambda = v_lambda, slope = 0.60)
ARL(lambda = v_lambda, slope = 0.65)
ARL(lambda = v_lambda, slope = 0.70)
ARL(lambda = v_lambda, slope = 0.75)
ARL(lambda = v_lambda, slope = 0.80)
ARL(lambda = v_lambda, slope = 0.85)
ARL(lambda = v_lambda, slope = 0.90)
ARL(lambda = v_lambda, slope = 1.00)
ARL(lambda = v_lambda, slope = 1.05)
ARL(lambda = v_lambda, slope = 1.10)
ARL(lambda = v_lambda, slope = 1.15)
ARL(lambda = v_lambda, slope = 1.20)
ARL(lambda = v_lambda, slope = 1.25)
ARL(lambda = v_lambda, slope = 1.30)
ARL(lambda = v_lambda, slope = 1.40)
ARL(lambda = v_lambda, slope = 1.50)
ARL(lambda = v_lambda, slope = 1.60)
ARL(lambda = v_lambda, slope = 1.70)
ARL(lambda = v_lambda, slope = 1.80)
ARL(lambda = v_lambda, slope = 1.90)
ARL(lambda = v_lambda, slope = 2.00)
```

```
ARL(lambda = v_lambda, slope = 2.50)
ARL(lambda = v_lambda, slope = 3.00)
sink()
```

APPENDIX B

AVERAGE RUNNING LENGTH UNDER LINEAR DRIFT

Table B1-1

	Chart	ARL1	*SD*	Lambda
1	Ft	221.12	102.9	0.0005
2	at	221.42	102.7	0.0005
3	Ft	223.05	101.3	0.0010
4	bt	223.18	101.2	0.0005
5	at	223.96	100.5	0.0010
6	bt	227.00	97.7	0.0010
7	DEWMA	240.87	83.3	0.0100
8	Ft	241.44	81.7	0.0050
9	at	242.14	80.9	0.0050
10	bt	247.28	73.6	0.0050
11	DEWMA	248.19	73.1	0.0050
12	EWMA	248.93	71.4	0.0050
13	Ft	251.04	67.6	0.0100
14	at	251.19	67.3	0.0100
15	bt	251.77	66.2	0.0100
16	EWMA	251.97	66.2	0.0100
17	DEWMA	252.98	64.4	0.0500
18	EWMA	255.48	59.2	0.2000
19	DEWMA	256.10	58.3	0.1000
20	EWMA	256.54	57.2	0.0500
21	Ft	256.67	56.8	0.1000
22	Ft	256.78	56.6	0.2000
23	DEWMA	256.89	56.5	0.2000
24	at	257.29	55.5	0.2000
25	at	257.60	54.9	0.1000
26	DEWMA	257.65	54.8	0.3000
27	Ft	257.68	54.7	0.0500
28	bt	257.71	54.7	0.0500
29	EWMA	257.82	54.5	0.1000
30	at	257.85	54.4	0.0500
31	bt	257.91	54.3	0.1000
32	DEWMA	258.27	53.4	0.5000
33	Shewhart	258.47	52.9	0.0010
34	Ft	258.54	52.8	0.3000
35	EWMA	258.59	52.8	0.5000
36	Shewhart	258.59	52.8	0.0500
37	Shewhart	258.64	52.7	0.5000
38	Shewhart	258.69	52.6	0.2000
39	Shewhart	258.80	52.2	0.1000
40	EWMA	258.81	52.3	0.3000
41	Shewhart	258.90	52.0	0.0100
42	Shewhart	259.13	51.6	0.0050
43	at	259.15	51.6	0.5000
44	Shewhart	259.17	51.4	0.3000
45	bt	259.24	51.3	0.2000
46	bt	259.29	51.2	0.5000
47	Shewhart	259.33	51.1	0.0005
48	bt	259.50	50.7	0.3000
49	at	259.52	50.6	0.3000
50	EWMA	263.13	42.0	0.0010
51	EWMA	268.56	19.4	0.0005
52	Ft	269.77	7.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-1

	Chart	ARL1	*SD*	Lambda
1	Ft	222.41	101.8	0.0005
2	at	222.72	101.5	0.0005
3	bt	224.29	100.2	0.0005
4	Ft	224.43	100.1	0.0010
5	at	225.54	99.0	0.0010
6	bt	227.80	96.9	0.0010
7	DEWMA	241.05	83.0	0.0100
8	Ft	242.66	80.3	0.0050
9	at	243.26	79.5	0.0050
10	DEWMA	248.08	73.2	0.0050
11	bt	249.28	70.7	0.0050
12	EWMA	250.46	69.1	0.0050
13	Ft	250.67	68.2	0.0100
14	at	250.70	68.2	0.0100
15	bt	251.60	66.5	0.0100
16	DEWMA	251.63	66.8	0.0500
17	EWMA	252.12	66.0	0.0100
18	DEWMA	255.12	60.2	0.1000
19	EWMA	255.68	59.0	0.0500
20	DEWMA	255.74	58.7	0.2000
21	EWMA	255.94	58.3	0.2000
22	Ft	257.22	55.9	0.0500
23	Ft	257.39	55.3	0.1000
24	at	257.45	55.4	0.0500
25	EWMA	257.47	55.2	0.1000
26	DEWMA	257.51	55.0	0.3000
27	bt	257.74	54.5	0.1000
28	bt	257.97	54.2	0.0500
29	Ft	258.14	53.7	0.2000
30	at	258.17	53.6	0.1000
31	Ft	258.27	53.4	0.3000
32	Shewhart	258.40	53.2	0.1000
33	bt	258.70	52.5	0.3000
34	at	258.75	52.4	0.2000
35	Shewhart	258.76	52.3	0.0500
36	Shewhart	258.85	52.1	0.0050
37	at	258.88	52.1	0.3000
38	EWMA	258.95	51.9	0.3000
39	Shewhart	259.02	51.8	0.2000
40	bt	259.04	51.8	0.2000
41	Shewhart	259.16	51.4	0.3000
42	Shewhart	259.39	51.0	0.0010
43	Shewhart	259.40	50.9	0.0005
44	Shewhart	259.45	50.8	0.0100
45	bt	259.47	50.8	0.5000
46	Shewhart	259.55	50.5	0.5000
47	DEWMA	259.57	50.5	0.5000
48	at	260.21	48.9	0.5000
49	EWMA	260.30	48.8	0.5000
50	EWMA	264.09	39.0	0.0010
51	EWMA	268.75	18.0	0.0005
52	Ft	269.82	6.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-2

	Chart	ARL1	SD	Lambda
1	Ft	219.26	104.1	0.0005
2	at	219.43	104.0	0.0005
3	Ft	219.90	103.5	0.0010
4	bt	220.79	102.9	0.0005
5	at	220.98	102.6	0.0010
6	bt	223.25	100.7	0.0010
7	Ft	237.72	85.8	0.0050
8	at	238.52	84.9	0.0050
9	DEWMA	240.67	83.5	0.0100
10	bt	243.65	78.3	0.0050
11	at	245.17	76.0	0.0100
12	Ft	245.51	75.5	0.0100
13	bt	246.20	74.3	0.0100
14	EWMA	247.13	73.7	0.0050
15	EWMA	248.09	72.1	0.0100
16	DEWMA	248.64	72.3	0.0050
17	DEWMA	249.64	69.7	0.0500
18	EWMA	249.85	68.6	0.0500
19	Ft	249.93	68.3	0.0500
20	at	250.23	67.9	0.0500
21	DEWMA	250.60	67.7	0.1000
22	EWMA	250.72	67.1	0.2000
23	Ft	250.96	66.7	0.1000
24	DEWMA	251.25	66.4	0.2000
25	DEWMA	251.26	66.2	0.3000
26	EWMA	251.72	65.5	0.1000
27	bt	251.92	65.2	0.0500
28	at	252.18	64.6	0.1000
29	EWMA	253.30	62.8	0.3000
30	DEWMA	253.87	61.8	0.5000
31	bt	254.04	61.5	0.1000
32	Ft	254.17	61.3	0.2000
33	Ft	254.82	60.1	0.3000
34	at	255.24	59.4	0.2000
35	Shewhart	255.33	59.3	0.0100
36	at	255.67	58.5	0.3000
37	EWMA	255.83	58.3	0.5000
38	Shewhart	256.36	57.2	0.3000
39	Shewhart	256.62	56.8	0.0050
40	Shewhart	256.80	56.4	0.0010
41	Shewhart	256.96	56.1	0.2000
42	Shewhart	257.05	55.9	0.0005
43	at	257.24	55.5	0.5000
44	bt	257.28	55.5	0.2000
45	Shewhart	257.43	55.2	0.0500
46	Shewhart	257.48	55.0	0.1000
47	bt	257.48	55.1	0.3000
48	Shewhart	257.72	54.5	0.5000
49	bt	260.72	47.8	0.5000
50	EWMA	262.73	42.9	0.0010
51	EWMA	268.38	20.3	0.0005
52	Ft	269.75	8.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-2

	Chart	ARL1	SD	Lambda
1	Ft	217.15	105.8	0.0005
2	at	217.20	105.7	0.0005
3	bt	218.94	104.4	0.0005
4	Ft	222.12	101.7	0.0010
5	at	223.39	100.6	0.0010
6	bt	225.75	98.5	0.0010
7	Ft	238.26	85.1	0.0050
8	at	239.01	84.2	0.0050
9	DEWMA	240.97	83.1	0.0100
10	bt	243.79	78.0	0.0050
11	Ft	245.05	76.1	0.0100
12	at	245.29	75.8	0.0100
13	bt	245.63	75.1	0.0100
14	EWMA	248.48	71.4	0.0100
15	EWMA	248.82	71.3	0.0050
16	DEWMA	249.30	70.2	0.0500
17	DEWMA	249.68	70.7	0.0050
18	Ft	249.88	68.4	0.0500
19	EWMA	249.95	68.4	0.0500
20	DEWMA	250.09	68.5	0.1000
21	EWMA	250.18	68.0	0.2000
22	EWMA	250.34	67.8	0.1000
23	Ft	250.68	67.3	0.1000
24	at	250.74	67.0	0.0500
25	DEWMA	251.31	66.3	0.2000
26	at	251.45	66.0	0.1000
27	bt	251.46	66.0	0.0500
28	DEWMA	251.84	65.2	0.3000
29	bt	252.91	63.7	0.1000
30	Ft	253.32	62.9	0.2000
31	at	253.50	62.6	0.2000
32	EWMA	253.85	61.8	0.3000
33	DEWMA	254.55	60.5	0.5000
34	EWMA	254.89	60.0	0.5000
35	Ft	255.17	59.4	0.3000
36	Shewhart	255.59	58.8	0.0100
37	at	255.60	58.7	0.5000
38	at	255.75	58.3	0.3000
39	Shewhart	256.13	57.7	0.2000
40	Shewhart	256.60	56.8	0.5000
41	Shewhart	256.76	56.5	0.0005
42	Shewhart	256.82	56.3	0.0500
43	Shewhart	256.94	56.0	0.3000
44	bt	256.94	56.2	0.2000
45	Shewhart	257.13	55.7	0.1000
46	Shewhart	257.22	55.5	0.0010
47	Shewhart	257.63	54.7	0.0050
48	bt	257.70	54.6	0.3000
49	bt	258.96	51.9	0.5000
50	EWMA	263.26	41.3	0.0010
51	EWMA	268.25	21.3	0.0005
52	Ft	269.78	7.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-3

	Chart	ARL1	SD	Lambda
1	Ft	213.06	108.0	0.0010
2	Ft	213.15	108.2	0.0005
3	at	213.39	107.9	0.0005
4	at	214.61	106.9	0.0010
5	bt	215.33	106.6	0.0005
6	bt	216.82	105.2	0.0010
7	Ft	229.23	94.0	0.0050
8	at	230.05	93.2	0.0050
9	Ft	233.63	89.1	0.0100
10	bt	233.72	89.1	0.0050
11	at	233.84	88.8	0.0100
12	bt	234.02	88.3	0.0100
13	Ft	235.07	86.8	0.0500
14	DEWMA	235.17	86.6	0.2000
15	EWMA	235.46	86.3	0.1000
16	at	235.72	86.1	0.0500
17	DEWMA	236.17	85.8	0.1000
18	DEWMA	236.51	85.3	0.3000
19	EWMA	236.60	85.2	0.2000
20	EWMA	237.06	84.8	0.0500
21	Ft	237.59	84.2	0.1000
22	DEWMA	238.14	86.2	0.0100
23	at	238.81	82.8	0.1000
24	bt	239.49	82.0	0.0500
25	EWMA	239.77	82.6	0.0100
26	DEWMA	241.93	79.9	0.0500
27	EWMA	242.18	80.0	0.0050
28	EWMA	242.33	78.6	0.3000
29	DEWMA	243.99	76.5	0.5000
30	Ft	244.19	76.3	0.2000
31	at	244.93	75.3	0.2000
32	bt	246.04	74.0	0.1000
33	DEWMA	247.95	73.4	0.0050
34	at	248.39	70.5	0.3000
35	EWMA	248.48	70.3	0.5000
36	Ft	248.72	70.1	0.3000
37	at	251.73	65.4	0.5000
38	Shewhart	252.02	65.0	0.1000
39	Shewhart	252.20	64.7	0.3000
40	Shewhart	252.44	64.3	0.0005
41	Shewhart	252.59	64.1	0.0500
42	Shewhart	253.01	63.4	0.5000
43	Shewhart	253.06	63.3	0.0050
44	Shewhart	253.28	62.8	0.0010
45	Shewhart	253.42	62.7	0.2000
46	Shewhart	253.48	62.5	0.0100
47	bt	253.50	62.6	0.2000
48	bt	257.09	55.9	0.3000
49	bt	258.04	53.9	0.5000
50	EWMA	260.47	48.7	0.0010
51	EWMA	267.64	24.5	0.0005
52	Ft	269.42	12.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-3

	Chart	ARL1	SD	Lambda
1	Ft	211.19	109.5	0.0005
2	at	211.56	109.3	0.0005
3	bt	212.84	108.3	0.0005
4	Ft	213.11	108.1	0.0010
5	at	214.14	107.3	0.0010
6	bt	216.37	105.6	0.0010
7	Ft	229.18	94.0	0.0050
8	at	229.78	93.4	0.0050
9	at	234.34	88.3	0.0100
10	Ft	234.40	88.3	0.0100
11	bt	234.58	88.2	0.0050
12	Ft	235.14	86.6	0.0500
13	DEWMA	235.31	86.5	0.2000
14	bt	235.40	86.9	0.0100
15	EWMA	235.45	86.4	0.2000
16	at	235.60	86.1	0.0500
17	EWMA	236.15	85.6	0.0500
18	EWMA	236.15	85.6	0.1000
19	DEWMA	237.10	84.7	0.1000
20	DEWMA	237.65	84.0	0.3000
21	Ft	237.80	83.9	0.1000
22	bt	238.31	83.3	0.0500
23	DEWMA	238.43	85.9	0.0100
24	at	238.68	82.8	0.1000
25	EWMA	240.48	81.8	0.0100
26	EWMA	242.27	79.9	0.0050
27	DEWMA	242.43	79.2	0.0500
28	EWMA	243.09	77.6	0.3000
29	DEWMA	243.19	77.5	0.5000
30	Ft	243.47	77.3	0.2000
31	at	244.28	76.2	0.2000
32	bt	245.89	74.2	0.1000
33	DEWMA	247.80	73.5	0.0050
34	at	248.26	70.7	0.3000
35	EWMA	248.39	70.5	0.5000
36	Ft	248.81	70.0	0.3000
37	at	251.46	65.9	0.5000
38	Shewhart	251.95	65.1	0.0005
39	Shewhart	252.39	64.3	0.2000
40	Shewhart	252.45	64.3	0.0100
41	Shewhart	252.68	63.9	0.0500
42	Shewhart	252.93	63.4	0.3000
43	Shewhart	252.93	63.5	0.1000
44	Shewhart	252.94	63.5	0.0010
45	Shewhart	253.04	63.3	0.5000
46	bt	253.30	63.0	0.2000
47	Shewhart	254.29	61.0	0.0050
48	bt	257.11	55.9	0.3000
49	bt	257.88	54.3	0.5000
50	EWMA	260.84	47.8	0.0010
51	EWMA	267.27	26.3	0.0005
52	Ft	269.47	11.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-4

	Chart	ARL1	SD	Lambda
1	Ft	171.92	121.2	0.0500
2	at	171.96	121.2	0.0500
3	EWMA	175.69	120.4	0.0500
4	DEWMA	176.26	120.2	0.2000
5	EWMA	177.01	119.9	0.1000
6	EWMA	182.46	118.7	0.2000
7	DEWMA	184.79	117.8	0.3000
8	bt	186.22	117.8	0.0100
9	Ft	186.55	117.3	0.1000
10	DEWMA	187.26	116.9	0.1000
11	at	187.51	116.9	0.1000
12	bt	190.27	116.0	0.0500
13	Ft	190.33	116.6	0.0100
14	at	190.48	116.5	0.0100
15	at	191.11	119.1	0.0005
16	Ft	191.20	119.2	0.0005
17	Ft	191.63	118.6	0.0010
18	bt	192.30	118.5	0.0005
19	at	192.74	118.1	0.0010
20	bt	193.82	117.4	0.0010
21	Ft	194.36	115.7	0.0050
22	at	195.62	115.1	0.0050
23	bt	195.83	114.5	0.0050
24	EWMA	201.36	111.1	0.3000
25	DEWMA	204.15	109.7	0.5000
26	at	207.77	107.8	0.2000
27	EWMA	208.49	108.0	0.0100
28	Ft	209.59	106.9	0.2000
29	DEWMA	213.02	105.0	0.0500
30	EWMA	219.17	100.5	0.5000
31	EWMA	219.64	101.1	0.0050
32	bt	220.57	99.6	0.1000
33	at	221.80	98.5	0.3000
34	Ft	225.82	95.3	0.3000
35	at	233.58	88.3	0.5000
36	DEWMA	234.75	89.8	0.0100
37	Shewhart	240.24	81.1	0.0100
38	Shewhart	240.37	81.0	0.0010
39	Shewhart	240.90	80.4	0.1000
40	Shewhart	241.56	79.5	0.3000
41	Shewhart	241.57	79.5	0.0005
42	Shewhart	241.61	79.5	0.5000
43	Shewhart	241.82	79.2	0.0500
44	Shewhart	241.88	79.1	0.0050
45	Shewhart	242.02	79.0	0.2000
46	bt	244.94	75.6	0.2000
47	DEWMA	245.03	77.4	0.0050
48	bt	252.97	63.5	0.3000
49	EWMA	254.94	59.9	0.0010
50	bt	257.03	56.1	0.5000
51	EWMA	265.69	32.7	0.0005
52	Ft	269.15	14.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-4

	Chart	ARL1	SD	Lambda
1	Ft	173.07	121.0	0.0500
2	at	173.77	120.8	0.0500
3	EWMA	174.21	120.7	0.1000
4	DEWMA	174.85	120.5	0.2000
5	EWMA	177.11	120.1	0.0500
6	EWMA	180.52	119.2	0.2000
7	DEWMA	183.91	118.2	0.3000
8	Ft	184.20	118.1	0.1000
9	at	184.29	118.0	0.1000
10	DEWMA	186.18	117.3	0.1000
11	bt	186.59	117.6	0.0100
12	at	190.51	116.4	0.0100
13	bt	191.31	115.7	0.0500
14	Ft	191.33	116.1	0.0100
15	Ft	191.53	118.7	0.0010
16	at	192.62	118.2	0.0010
17	at	192.90	118.3	0.0005
18	Ft	192.94	118.3	0.0005
19	bt	193.41	117.7	0.0010
20	bt	193.71	117.9	0.0005
21	Ft	199.14	113.5	0.0050
22	at	199.23	113.4	0.0050
23	bt	200.23	112.3	0.0050
24	EWMA	201.57	111.1	0.3000
25	DEWMA	203.30	110.1	0.5000
26	at	206.84	108.3	0.2000
27	EWMA	208.76	107.7	0.0100
28	Ft	208.93	107.2	0.2000
29	DEWMA	212.73	105.2	0.0500
30	EWMA	219.17	100.4	0.5000
31	bt	219.83	100.2	0.1000
32	at	221.96	98.4	0.3000
33	EWMA	222.46	98.9	0.0050
34	Ft	225.09	96.0	0.3000
35	at	234.31	87.5	0.5000
36	DEWMA	234.43	90.2	0.0100
37	Shewhart	240.23	81.1	0.0100
38	Shewhart	240.32	81.0	0.5000
39	Shewhart	240.39	80.9	0.0005
40	Shewhart	240.67	80.7	0.3000
41	Shewhart	240.75	80.6	0.0500
42	Shewhart	241.03	80.2	0.1000
43	Shewhart	241.31	79.9	0.2000
44	Shewhart	241.46	79.7	0.0050
45	Shewhart	242.40	78.5	0.0010
46	bt	244.69	75.9	0.2000
47	DEWMA	246.51	75.3	0.0050
48	bt	252.77	64.0	0.3000
49	EWMA	254.72	60.3	0.0010
50	bt	256.70	56.7	0.5000
51	EWMA	265.97	31.7	0.0005
52	Ft	269.08	15.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-5

	Chart	ARL1	SD	Lambda
1	at	88.65	109.7	0.0500
2	Ft	89.90	110.5	0.0500
3	EWMA	92.96	111.9	0.1000
4	EWMA	94.88	112.6	0.0500
5	DEWMA	95.80	113.1	0.2000
6	DEWMA	105.37	117.2	0.3000
7	EWMA	105.52	117.4	0.2000
8	at	107.22	117.9	0.1000
9	Ft	109.01	118.5	0.1000
10	DEWMA	109.42	117.9	0.1000
11	bt	116.12	120.5	0.0500
12	bt	119.78	121.3	0.0100
13	at	128.86	123.0	0.0100
14	Ft	129.45	123.1	0.0100
15	EWMA	134.25	123.5	0.3000
16	DEWMA	135.99	123.7	0.5000
17	bt	143.43	124.4	0.0050
18	at	147.90	124.1	0.2000
19	Ft	150.64	125.0	0.0050
20	at	151.63	124.9	0.0050
21	Ft	154.74	123.9	0.2000
22	EWMA	160.70	123.5	0.0100
23	Ft	165.16	125.9	0.0005
24	at	165.72	125.8	0.0005
25	Ft	165.89	125.4	0.0010
26	bt	166.08	125.6	0.0005
27	bt	166.88	124.9	0.0010
28	at	167.29	125.1	0.0010
29	EWMA	168.56	122.0	0.5000
30	DEWMA	169.38	121.7	0.0500
31	bt	173.53	121.4	0.1000
32	at	175.06	120.7	0.3000
33	Ft	185.28	118.0	0.3000
34	EWMA	188.87	117.1	0.0050
35	at	203.74	110.0	0.5000
36	Shewhart	221.01	99.2	0.1000
37	Shewhart	221.04	99.0	0.3000
38	Shewhart	221.11	99.1	0.0005
39	Shewhart	221.76	98.6	0.2000
40	Shewhart	221.85	98.5	0.0010
41	Shewhart	222.18	98.3	0.0100
42	Shewhart	222.27	98.1	0.5000
43	Shewhart	222.38	98.1	0.0050
44	Shewhart	223.32	97.3	0.0500
45	DEWMA	231.48	92.7	0.0100
46	bt	233.05	89.1	0.2000
47	EWMA	244.51	75.7	0.0010
48	DEWMA	246.00	75.8	0.0050
49	bt	248.67	70.4	0.3000
50	bt	255.60	58.8	0.5000
51	EWMA	261.87	44.2	0.0005
52	Ft	267.50	24.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-5

	Chart	ARL1	SD	Lambda
1	at	91.21	111.1	0.0500
2	Ft	93.11	112.1	0.0500
3	EWMA	93.25	112.1	0.1000
4	DEWMA	95.70	113.1	0.2000
5	EWMA	96.22	113.3	0.0500
6	DEWMA	105.35	117.2	0.3000
7	EWMA	105.96	117.6	0.2000
8	at	106.05	117.3	0.1000
9	Ft	107.31	117.9	0.1000
10	DEWMA	111.00	118.4	0.1000
11	bt	119.31	121.2	0.0100
12	bt	120.21	121.4	0.0500
13	at	127.68	122.9	0.0100
14	Ft	128.35	123.0	0.0100
15	EWMA	134.62	123.5	0.3000
16	DEWMA	141.71	124.0	0.5000
17	bt	144.19	124.5	0.0050
18	at	147.49	124.3	0.2000
19	Ft	151.12	125.1	0.0050
20	at	151.69	124.9	0.0050
21	Ft	154.61	124.1	0.2000
22	EWMA	160.38	123.5	0.0100
23	Ft	165.19	125.5	0.0010
24	bt	165.72	125.1	0.0010
25	at	166.64	125.2	0.0010
26	bt	168.35	125.1	0.0005
27	at	168.36	125.3	0.0005
28	Ft	168.42	125.3	0.0005
29	DEWMA	168.92	122.0	0.0500
30	EWMA	171.49	121.5	0.5000
31	bt	173.65	121.4	0.1000
32	at	177.90	120.0	0.3000
33	Ft	187.59	117.1	0.3000
34	EWMA	187.95	117.5	0.0050
35	at	203.36	110.3	0.5000
36	Shewhart	219.88	100.0	0.0010
37	Shewhart	220.93	99.3	0.0100
38	Shewhart	221.26	99.0	0.0500
39	Shewhart	221.54	98.7	0.2000
40	Shewhart	222.20	98.2	0.1000
41	Shewhart	222.21	98.2	0.0050
42	Shewhart	222.26	98.2	0.5000
43	Shewhart	222.49	98.0	0.0005
44	Shewhart	223.70	97.1	0.3000
45	bt	231.40	90.9	0.2000
46	DEWMA	231.87	92.5	0.0100
47	EWMA	243.37	77.1	0.0010
48	DEWMA	244.42	78.0	0.0050
49	bt	248.32	71.0	0.3000
50	bt	255.59	58.9	0.5000
51	EWMA	261.74	44.5	0.0005
52	Ft	268.16	21.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-6

	Chart	ARL1	SD	Lambda
1	at	37.93	62.8	0.0500
2	Ft	39.11	64.9	0.0500
3	EWMA	39.54	65.5	0.1000
4	DEWMA	39.69	65.6	0.2000
5	EWMA	40.33	66.2	0.0500
6	EWMA	47.40	77.2	0.2000
7	DEWMA	47.62	77.0	0.3000
8	at	48.32	78.0	0.1000
9	Ft	50.96	81.3	0.1000
10	DEWMA	51.14	79.6	0.1000
11	bt	58.40	88.8	0.0500
12	bt	60.61	90.4	0.0100
13	EWMA	68.61	97.5	0.3000
14	at	70.75	99.0	0.0100
15	Ft	71.74	99.8	0.0100
16	DEWMA	73.04	100.9	0.5000
17	at	80.94	106.2	0.2000
18	bt	85.44	108.7	0.0050
19	Ft	90.73	111.7	0.2000
20	Ft	100.28	116.3	0.0050
21	at	100.48	116.3	0.0050
22	EWMA	106.64	117.7	0.0100
23	EWMA	108.46	118.3	0.5000
24	DEWMA	116.20	119.9	0.0500
25	at	117.38	120.8	0.3000
26	bt	119.06	121.8	0.1000
27	bt	132.21	126.0	0.0010
28	Ft	133.83	126.5	0.0010
29	Ft	134.85	123.8	0.3000
30	at	135.38	126.6	0.0010
31	bt	138.90	126.9	0.0005
32	at	139.54	127.1	0.0005
33	Ft	139.54	127.2	0.0005
34	EWMA	146.07	124.4	0.0050
35	at	159.59	123.3	0.5000
36	Shewhart	190.70	115.9	0.2000
37	Shewhart	191.70	115.5	0.0100
38	Shewhart	192.09	115.2	0.1000
39	Shewhart	192.14	115.4	0.0050
40	Shewhart	192.58	115.2	0.0005
41	Shewhart	193.01	115.0	0.5000
42	Shewhart	193.39	114.8	0.0010
43	Shewhart	193.39	114.8	0.0500
44	Shewhart	194.16	114.5	0.3000
45	bt	215.13	103.9	0.2000
46	DEWMA	227.68	96.1	0.0100
47	EWMA	227.97	93.1	0.0010
48	bt	242.34	79.0	0.3000
49	DEWMA	244.58	77.7	0.0050
50	EWMA	255.41	58.3	0.0005
51	bt	255.82	58.5	0.5000
52	Ft	265.76	32.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-6

	Chart	ARL1	SD	Lambda
1	at	37.78	62.7	0.0500
2	Ft	38.94	64.8	0.0500
3	EWMA	39.53	65.6	0.1000
4	DEWMA	39.95	66.4	0.2000
5	EWMA	40.98	67.3	0.0500
6	DEWMA	46.23	75.5	0.3000
7	EWMA	46.28	75.8	0.2000
8	at	47.95	77.6	0.1000
9	Ft	50.36	80.6	0.1000
10	DEWMA	51.54	80.1	0.1000
11	bt	56.82	87.4	0.0500
12	bt	59.77	89.7	0.0100
13	EWMA	66.93	96.3	0.3000
14	at	69.69	98.4	0.0100
15	Ft	70.24	98.8	0.0100
16	DEWMA	72.73	100.8	0.5000
17	at	81.22	106.4	0.2000
18	bt	85.47	108.8	0.0050
19	Ft	90.27	111.5	0.2000
20	Ft	100.20	116.4	0.0050
21	at	100.52	116.5	0.0050
22	EWMA	102.86	116.4	0.0100
23	EWMA	108.72	118.5	0.5000
24	at	113.61	120.0	0.3000
25	DEWMA	116.87	120.1	0.0500
26	bt	119.88	122.0	0.1000
27	bt	129.69	125.7	0.0010
28	Ft	130.90	123.5	0.3000
29	Ft	131.41	126.2	0.0010
30	at	132.50	126.3	0.0010
31	bt	138.08	126.9	0.0005
32	Ft	138.48	127.1	0.0005
33	at	138.80	127.1	0.0005
34	EWMA	145.68	124.5	0.0050
35	at	158.88	123.5	0.5000
36	Shewhart	191.32	115.7	0.2000
37	Shewhart	191.34	115.6	0.0050
38	Shewhart	192.23	115.3	0.0500
39	Shewhart	192.33	115.3	0.3000
40	Shewhart	192.39	115.3	0.0005
41	Shewhart	193.03	115.0	0.0100
42	Shewhart	193.30	114.9	0.5000
43	Shewhart	194.06	114.5	0.1000
44	Shewhart	194.32	114.5	0.0010
45	bt	218.36	101.7	0.2000
46	DEWMA	226.15	97.3	0.0100
47	EWMA	227.10	93.9	0.0010
48	bt	240.91	80.7	0.3000
49	DEWMA	243.85	78.6	0.0050
50	bt	253.48	62.7	0.5000
51	EWMA	256.04	57.0	0.0005
52	Ft	265.17	34.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-7

	Chart	ARL1	SD	Lambda
1	at	20.82	21.9	0.0500
2	Ft	21.19	23.9	0.0500
3	EWMA	21.42	25.2	0.1000
4	EWMA	21.96	25.3	0.0500
5	DEWMA	22.02	26.7	0.2000
6	DEWMA	23.07	31.7	0.3000
7	EWMA	23.30	33.0	0.2000
8	at	23.48	33.3	0.1000
9	Ft	24.72	37.8	0.1000
10	DEWMA	25.61	34.9	0.1000
11	bt	26.93	42.7	0.0500
12	bt	30.67	49.7	0.0100
13	EWMA	32.29	54.6	0.3000
14	DEWMA	34.00	57.8	0.5000
15	at	36.39	60.6	0.0100
16	Ft	37.21	62.1	0.0100
17	at	39.24	66.5	0.2000
18	bt	46.32	75.7	0.0050
19	Ft	46.63	76.9	0.2000
20	EWMA	57.54	88.2	0.5000
21	at	58.87	90.2	0.0050
22	Ft	59.12	90.6	0.0050
23	EWMA	62.44	92.2	0.0100
24	at	62.95	93.3	0.3000
25	bt	69.17	99.4	0.1000
26	DEWMA	72.78	99.6	0.0500
27	Ft	83.03	107.8	0.3000
28	bt	99.33	117.8	0.0010
29	EWMA	102.55	116.7	0.0050
30	Ft	103.21	119.6	0.0010
31	at	104.33	119.9	0.0010
32	at	107.25	118.1	0.5000
33	bt	109.93	121.9	0.0005
34	at	111.46	122.5	0.0005
35	Ft	111.46	122.6	0.0005
36	Shewhart	152.71	124.0	0.2000
37	Shewhart	153.60	123.9	0.0100
38	Shewhart	153.85	123.9	0.0005
39	Shewhart	154.71	123.9	0.0050
40	Shewhart	154.86	123.8	0.3000
41	Shewhart	155.14	123.8	0.0500
42	Shewhart	155.76	123.7	0.0010
43	Shewhart	155.99	123.7	0.5000
44	Shewhart	156.35	123.7	0.1000
45	bt	195.54	114.7	0.2000
46	EWMA	205.81	108.4	0.0010
47	DEWMA	224.36	98.6	0.0100
48	bt	234.01	88.5	0.3000
49	DEWMA	240.86	82.2	0.0050
50	EWMA	246.09	72.8	0.0005
51	bt	252.81	63.9	0.5000
52	Ft	260.80	46.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-7

	Chart	ARL1	SD	Lambda
1	at	20.90	22.1	0.0500
2	EWMA	20.96	23.1	0.1000
3	Ft	21.22	24.0	0.0500
4	EWMA	21.72	23.9	0.0500
5	DEWMA	22.01	27.3	0.2000
6	DEWMA	23.11	31.7	0.3000
7	at	23.18	32.4	0.1000
8	EWMA	23.86	35.1	0.2000
9	Ft	24.22	36.2	0.1000
10	DEWMA	25.46	34.7	0.1000
11	bt	26.93	42.9	0.0500
12	bt	29.52	47.0	0.0100
13	EWMA	31.52	52.8	0.3000
14	DEWMA	34.20	58.2	0.5000
15	at	34.85	58.0	0.0100
16	Ft	35.39	59.0	0.0100
17	at	39.61	67.2	0.2000
18	bt	46.01	75.2	0.0050
19	Ft	47.42	78.1	0.2000
20	EWMA	55.75	86.5	0.5000
21	Ft	58.42	89.9	0.0050
22	at	58.76	90.1	0.0050
23	EWMA	59.30	89.4	0.0100
24	at	63.41	93.7	0.3000
25	bt	68.80	99.1	0.1000
26	DEWMA	71.96	98.8	0.0500
27	Ft	81.99	107.2	0.3000
28	EWMA	100.96	116.0	0.0050
29	bt	101.10	118.5	0.0010
30	Ft	104.62	120.2	0.0010
31	at	105.26	117.3	0.5000
32	at	105.93	120.5	0.0010
33	bt	107.67	121.2	0.0005
34	at	109.58	121.9	0.0005
35	Ft	109.74	122.0	0.0005
36	Shewhart	153.08	123.9	0.5000
37	Shewhart	153.92	123.9	0.1000
38	Shewhart	154.31	123.8	0.0100
39	Shewhart	154.56	123.8	0.0500
40	Shewhart	154.85	123.8	0.3000
41	Shewhart	155.30	123.8	0.2000
42	Shewhart	155.32	123.8	0.0050
43	Shewhart	156.57	123.7	0.0005
44	Shewhart	156.78	123.6	0.0010
45	bt	195.04	115.1	0.2000
46	EWMA	207.25	107.7	0.0010
47	DEWMA	221.06	101.4	0.0100
48	bt	234.95	87.4	0.3000
49	DEWMA	241.91	80.9	0.0050
50	EWMA	245.65	73.4	0.0005
51	bt	252.73	64.0	0.5000
52	Ft	260.36	47.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-8

	Chart	ARL1	SD	Lambda
1	at	17.31	7.7	0.0500
2	EWMA	17.33	7.8	0.1000
3	EWMA	17.34	10.7	0.2000
4	Ft	17.34	7.8	0.0500
5	DEWMA	17.47	7.8	0.2000
6	DEWMA	17.60	10.0	0.3000
7	at	17.61	10.7	0.1000
8	EWMA	17.87	7.4	0.0500
9	Ft	17.99	14.5	0.1000
10	bt	18.90	18.3	0.0500
11	DEWMA	19.78	13.0	0.1000
12	EWMA	20.02	21.8	0.3000
13	DEWMA	20.39	23.3	0.5000
14	bt	20.58	20.7	0.0100
15	at	22.04	26.2	0.0100
16	at	22.14	30.9	0.2000
17	Ft	22.32	27.4	0.0100
18	Ft	25.42	41.2	0.2000
19	bt	27.18	42.5	0.0050
20	EWMA	29.53	48.8	0.5000
21	at	33.16	56.3	0.3000
22	EWMA	34.33	56.9	0.0100
23	at	34.77	59.6	0.0050
24	Ft	34.78	59.8	0.0050
25	bt	38.35	67.3	0.1000
26	DEWMA	41.60	66.9	0.0500
27	Ft	44.91	74.8	0.3000
28	at	61.74	92.0	0.5000
29	EWMA	67.35	96.8	0.0050
30	bt	69.42	101.3	0.0010
31	Ft	74.67	105.5	0.0010
32	at	75.40	105.8	0.0010
33	bt	82.10	110.2	0.0005
34	Ft	83.95	111.4	0.0005
35	at	84.33	111.6	0.0005
36	Shewhart	109.22	118.7	0.0005
37	Shewhart	109.32	118.6	0.0050
38	Shewhart	110.02	119.0	0.0500
39	Shewhart	110.24	119.0	0.0100
40	Shewhart	111.25	119.1	0.3000
41	Shewhart	111.37	119.2	0.1000
42	Shewhart	111.60	119.3	0.5000
43	Shewhart	112.54	119.6	0.0010
44	Shewhart	113.48	119.8	0.2000
45	bt	167.39	123.6	0.2000
46	EWMA	179.90	118.8	0.0010
47	DEWMA	217.71	103.5	0.0100
48	bt	226.47	95.5	0.3000
49	EWMA	231.38	89.4	0.0005
50	DEWMA	240.04	83.2	0.0050
51	Ft	249.60	67.8	0.5000
52	bt	251.77	65.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-8

	Chart	ARL1	SD	Lambda
1	Ft	17.44	8.9	0.0500
2	at	17.44	8.5	0.0500
3	EWMA	17.46	11.3	0.2000
4	DEWMA	17.47	7.3	0.2000
5	EWMA	17.51	9.6	0.1000
6	at	17.79	12.3	0.1000
7	DEWMA	17.81	12.6	0.3000
8	EWMA	18.08	10.0	0.0500
9	Ft	18.19	15.9	0.1000
10	bt	18.97	18.7	0.0500
11	DEWMA	19.79	12.3	0.1000
12	EWMA	19.89	21.8	0.3000
13	DEWMA	20.15	22.7	0.5000
14	bt	20.42	19.6	0.0100
15	at	22.18	30.6	0.2000
16	at	22.55	28.4	0.0100
17	Ft	22.95	30.1	0.0100
18	Ft	25.31	40.6	0.2000
19	bt	26.60	41.1	0.0050
20	EWMA	29.50	49.2	0.5000
21	at	33.10	56.5	0.3000
22	Ft	34.06	58.5	0.0050
23	at	34.33	58.9	0.0050
24	EWMA	34.73	57.6	0.0100
25	bt	38.02	66.8	0.1000
26	DEWMA	42.62	68.5	0.0500
27	Ft	45.31	75.5	0.3000
28	at	61.94	92.4	0.5000
29	EWMA	68.07	97.4	0.0050
30	bt	70.72	102.3	0.0010
31	Ft	75.26	105.9	0.0010
32	at	76.48	106.6	0.0010
33	bt	82.61	110.5	0.0005
34	Ft	84.35	111.6	0.0005
35	at	84.78	111.8	0.0005
36	Shewhart	109.64	118.7	0.0500
37	Shewhart	109.98	118.9	0.5000
38	Shewhart	110.42	118.9	0.0005
39	Shewhart	110.49	118.9	0.1000
40	Shewhart	110.83	119.1	0.0010
41	Shewhart	111.08	119.2	0.0050
42	Shewhart	112.63	119.5	0.0100
43	Shewhart	112.95	119.7	0.2000
44	Shewhart	114.04	120.0	0.3000
45	bt	169.87	123.0	0.2000
46	EWMA	179.83	118.9	0.0010
47	DEWMA	218.00	103.4	0.0100
48	bt	225.54	96.3	0.3000
49	EWMA	230.51	90.1	0.0005
50	DEWMA	240.22	82.9	0.0050
51	Ft	250.16	66.8	0.5000
52	bt	251.56	66.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-9

	Chart	ARL1	SD	Lambda
1	EWMA	15.58	5.1	0.2000
2	at	15.65	4.4	0.1000
3	Ft	15.66	4.5	0.1000
4	Ft	15.70	4.4	0.0500
5	EWMA	15.72	4.2	0.1000
6	at	15.72	4.3	0.0500
7	DEWMA	15.74	5.0	0.3000
8	DEWMA	15.95	4.2	0.2000
9	bt	16.07	5.3	0.0500
10	EWMA	16.26	4.5	0.0500
11	EWMA	16.55	7.9	0.3000
12	DEWMA	16.77	9.4	0.5000
13	at	17.23	11.9	0.2000
14	bt	17.57	6.4	0.0100
15	DEWMA	17.93	5.3	0.1000
16	Ft	18.21	18.3	0.2000
17	at	18.31	11.3	0.0100
18	Ft	18.37	11.6	0.0100
19	EWMA	19.72	21.4	0.5000
20	bt	19.90	18.6	0.0050
21	at	20.51	25.1	0.3000
22	bt	21.89	33.8	0.1000
23	Ft	22.95	32.8	0.0050
24	EWMA	22.96	30.0	0.0100
25	at	23.04	32.7	0.0050
26	Ft	26.28	43.3	0.3000
27	DEWMA	27.19	38.4	0.0500
28	at	34.20	57.9	0.5000
29	EWMA	42.20	70.1	0.0050
30	bt	50.15	84.2	0.0010
31	Ft	54.58	89.3	0.0010
32	at	55.18	89.8	0.0010
33	bt	61.09	95.5	0.0005
34	Ft	63.09	97.3	0.0005
35	at	63.10	97.3	0.0005
36	Shewhart	70.22	98.9	0.3000
37	Shewhart	70.48	99.0	0.0010
38	Shewhart	70.66	99.2	0.0050
39	Shewhart	70.81	99.4	0.2000
40	Shewhart	70.98	99.4	0.5000
41	Shewhart	71.32	99.6	0.0100
42	Shewhart	71.79	100.1	0.1000
43	Shewhart	71.99	100.1	0.0500
44	Shewhart	72.53	100.6	0.0005
45	bt	135.39	125.4	0.2000
46	EWMA	149.84	123.2	0.0010
47	DEWMA	208.52	109.3	0.0100
48	EWMA	210.99	104.8	0.0005
49	bt	216.14	103.6	0.3000
50	Ft	230.83	89.8	0.5000
51	DEWMA	238.51	84.7	0.0050
52	bt	249.02	70.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-9

	Chart	ARL1	SD	Lambda
1	EWMA	15.55	5.8	0.2000
2	at	15.64	5.1	0.1000
3	EWMA	15.69	4.2	0.1000
4	Ft	15.74	5.7	0.1000
5	DEWMA	15.77	4.3	0.3000
6	Ft	15.82	4.3	0.0500
7	at	15.84	4.2	0.0500
8	DEWMA	15.95	4.2	0.2000
9	bt	16.24	5.8	0.0500
10	EWMA	16.38	4.4	0.0500
11	EWMA	16.67	7.4	0.3000
12	DEWMA	16.80	9.7	0.5000
13	at	17.22	12.4	0.2000
14	bt	17.66	8.6	0.0100
15	DEWMA	17.97	5.3	0.1000
16	Ft	18.19	18.6	0.2000
17	at	18.40	12.6	0.0100
18	Ft	18.51	13.4	0.0100
19	EWMA	19.50	20.4	0.5000
20	bt	20.20	21.3	0.0050
21	at	20.82	26.0	0.3000
22	bt	21.98	34.1	0.1000
23	EWMA	23.33	31.7	0.0100
24	at	23.49	34.9	0.0050
25	Ft	23.57	35.5	0.0050
26	Ft	26.73	44.3	0.3000
27	DEWMA	27.55	39.5	0.0500
28	at	34.90	59.2	0.5000
29	EWMA	42.50	70.8	0.0050
30	bt	48.57	82.6	0.0010
31	Ft	53.29	88.2	0.0010
32	at	53.70	88.5	0.0010
33	bt	58.92	93.6	0.0005
34	at	61.26	95.9	0.0005
35	Ft	61.57	96.2	0.0005
36	Shewhart	70.16	98.8	0.5000
37	Shewhart	70.43	99.0	0.2000
38	Shewhart	70.77	99.3	0.0010
39	Shewhart	70.91	99.4	0.0500
40	Shewhart	71.40	99.7	0.0100
41	Shewhart	71.83	100.2	0.0005
42	Shewhart	72.05	100.1	0.3000
43	Shewhart	72.55	100.7	0.1000
44	Shewhart	72.57	100.7	0.0050
45	bt	137.20	125.5	0.2000
46	EWMA	150.08	123.4	0.0010
47	EWMA	209.74	105.5	0.0005
48	DEWMA	209.74	108.6	0.0100
49	bt	216.96	103.0	0.3000
50	Ft	232.92	87.9	0.5000
51	DEWMA	237.98	85.4	0.0050
52	bt	248.09	71.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-10

	Chart	ARL1	SD	Lambda
1	EWMA	14.28	4.1	0.2000
2	Ft	14.42	4.0	0.1000
3	at	14.43	4.0	0.1000
4	DEWMA	14.46	4.7	0.3000
5	EWMA	14.54	3.8	0.1000
6	at	14.65	3.9	0.0500
7	Ft	14.66	3.9	0.0500
8	DEWMA	14.84	3.8	0.2000
9	bt	14.88	4.1	0.0500
10	EWMA	15.03	5.1	0.3000
11	DEWMA	15.07	4.4	0.5000
12	EWMA	15.21	4.1	0.0500
13	at	15.32	5.3	0.2000
14	Ft	15.67	7.0	0.2000
15	bt	16.35	4.9	0.0100
16	EWMA	16.58	7.1	0.5000
17	at	16.76	8.8	0.3000
18	at	16.83	5.8	0.0100
19	DEWMA	16.84	4.3	0.1000
20	Ft	16.87	5.9	0.0100
21	bt	17.12	18.1	0.1000
22	bt	17.48	7.7	0.0050
23	at	18.32	14.5	0.0050
24	Ft	18.33	15.1	0.0050
25	EWMA	18.86	12.1	0.0100
26	Ft	18.92	21.5	0.3000
27	DEWMA	21.98	20.7	0.0500
28	at	22.28	30.3	0.5000
29	EWMA	28.38	45.9	0.0050
30	bt	34.32	63.0	0.0010
31	at	38.46	70.0	0.0010
32	Ft	38.47	70.2	0.0010
33	Shewhart	41.86	69.8	0.0100
34	Shewhart	41.98	70.1	0.0500
35	Shewhart	42.08	70.1	0.0050
36	Shewhart	42.15	70.4	0.0005
37	Shewhart	42.51	70.9	0.1000
38	Shewhart	42.73	71.0	0.5000
39	bt	42.97	76.3	0.0005
40	Shewhart	43.23	71.7	0.0010
41	Shewhart	43.99	72.7	0.3000
42	Shewhart	44.46	73.5	0.2000
43	at	45.39	79.7	0.0005
44	Ft	45.59	79.9	0.0005
45	bt	105.64	119.8	0.2000
46	EWMA	119.61	120.3	0.0010
47	EWMA	188.05	115.6	0.0005
48	DEWMA	203.26	112.0	0.0100
49	Ft	203.48	109.0	0.5000
50	bt	204.34	110.9	0.3000
51	DEWMA	234.38	89.1	0.0050
52	bt	245.29	75.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-10

	Chart	ARL1	SD	Lambda
1	EWMA	14.20	4.1	0.2000
2	DEWMA	14.41	4.0	0.3000
3	Ft	14.41	4.0	0.1000
4	at	14.42	3.9	0.1000
5	EWMA	14.55	3.8	0.1000
6	Ft	14.56	4.0	0.0500
7	at	14.59	3.9	0.0500
8	DEWMA	14.77	3.8	0.2000
9	bt	14.82	4.1	0.0500
10	EWMA	15.06	5.1	0.3000
11	EWMA	15.16	4.1	0.0500
12	DEWMA	15.22	5.7	0.5000
13	at	15.25	5.2	0.2000
14	Ft	15.60	7.0	0.2000
15	bt	16.44	5.0	0.0100
16	EWMA	16.72	8.7	0.5000
17	at	16.80	9.2	0.3000
18	DEWMA	16.84	4.3	0.1000
19	at	16.86	5.9	0.0100
20	Ft	16.88	5.9	0.0100
21	bt	17.07	17.2	0.1000
22	bt	17.48	7.3	0.0050
23	at	18.50	15.9	0.0050
24	Ft	18.52	16.5	0.0050
25	Ft	18.91	21.2	0.3000
26	EWMA	19.01	14.1	0.0100
27	DEWMA	22.09	21.3	0.0500
28	at	22.32	30.5	0.5000
29	EWMA	28.75	46.8	0.0050
30	bt	34.62	63.4	0.0010
31	Ft	38.28	69.8	0.0010
32	at	38.62	70.1	0.0010
33	Shewhart	41.99	70.0	0.5000
34	Shewhart	42.15	70.3	0.0500
35	bt	42.33	75.3	0.0005
36	Shewhart	42.38	70.4	0.3000
37	Shewhart	42.56	70.9	0.0010
38	Shewhart	42.62	71.0	0.1000
39	Shewhart	42.67	71.0	0.0100
40	Shewhart	42.79	71.1	0.2000
41	Shewhart	43.23	71.7	0.0005
42	Shewhart	43.48	72.1	0.0050
43	at	44.53	78.4	0.0005
44	Ft	44.87	78.9	0.0005
45	bt	107.09	120.3	0.2000
46	EWMA	119.63	120.3	0.0010
47	EWMA	187.83	115.6	0.0005
48	DEWMA	201.72	112.9	0.0100
49	bt	203.95	111.0	0.3000
50	Ft	206.19	107.5	0.5000
51	DEWMA	234.72	88.7	0.0050
52	bt	246.38	73.9	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-11

	Chart	ARL1	SD	Lambda
1	EWMA	13.26	3.7	0.2000
2	Ft	13.30	3.7	0.1000
3	at	13.32	3.6	0.1000
4	DEWMA	13.45	3.6	0.3000
5	EWMA	13.49	3.5	0.1000
6	at	13.69	3.6	0.0500
7	Ft	13.69	3.6	0.0500
8	EWMA	13.88	3.9	0.3000
9	bt	13.90	3.8	0.0500
10	DEWMA	13.90	3.5	0.2000
11	DEWMA	13.99	4.1	0.5000
12	at	14.17	4.1	0.2000
13	EWMA	14.24	3.8	0.0500
14	Ft	14.35	5.1	0.2000
15	bt	14.76	7.8	0.1000
16	EWMA	15.20	4.6	0.5000
17	at	15.24	4.7	0.3000
18	bt	15.48	4.7	0.0100
19	at	15.90	5.0	0.0100
20	DEWMA	15.91	4.1	0.1000
21	Ft	15.93	5.0	0.0100
22	Ft	16.08	9.2	0.3000
23	bt	16.56	6.0	0.0050
24	at	17.01	8.8	0.0050
25	Ft	17.02	9.8	0.0050
26	EWMA	17.65	9.4	0.0100
27	at	17.91	13.2	0.5000
28	DEWMA	19.88	12.3	0.0500
29	EWMA	22.16	28.2	0.0050
30	bt	25.30	44.7	0.0010
31	Shewhart	26.45	41.4	0.0050
32	Shewhart	26.75	42.1	0.5000
33	Shewhart	26.79	42.3	0.3000
34	Shewhart	26.93	42.6	0.0100
35	Shewhart	27.35	43.7	0.0005
36	Shewhart	27.42	43.7	0.0010
37	Shewhart	27.45	44.1	0.1000
38	Shewhart	27.61	44.5	0.2000
39	Shewhart	27.77	44.9	0.0500
40	Ft	28.13	52.0	0.0010
41	at	28.26	52.0	0.0010
42	bt	30.09	56.2	0.0005
43	Ft	32.17	60.5	0.0005
44	at	32.29	60.6	0.0005
45	bt	76.63	106.6	0.2000
46	EWMA	93.50	111.4	0.0010
47	EWMA	159.90	121.8	0.0005
48	Ft	171.39	120.1	0.5000
49	bt	187.60	118.5	0.3000
50	DEWMA	196.43	115.2	0.0100
51	DEWMA	232.81	90.6	0.0050
52	bt	245.18	75.5	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-11

	Chart	ARL1	SD	Lambda
1	EWMA	13.24	3.7	0.2000
2	at	13.40	3.7	0.1000
3	Ft	13.41	3.7	0.1000
4	DEWMA	13.46	3.6	0.3000
5	EWMA	13.55	3.6	0.1000
6	Ft	13.70	3.6	0.0500
7	at	13.70	3.6	0.0500
8	DEWMA	13.86	3.5	0.2000
9	EWMA	13.90	4.0	0.3000
10	bt	13.92	3.8	0.0500
11	DEWMA	13.97	4.0	0.5000
12	at	14.14	4.9	0.2000
13	EWMA	14.26	3.8	0.0500
14	Ft	14.32	5.0	0.2000
15	bt	14.80	6.4	0.1000
16	EWMA	15.18	4.5	0.5000
17	at	15.32	5.9	0.3000
18	bt	15.36	4.7	0.0100
19	at	15.74	5.1	0.0100
20	Ft	15.80	5.7	0.0100
21	DEWMA	15.93	4.1	0.1000
22	Ft	16.16	10.2	0.3000
23	bt	16.48	5.4	0.0050
24	at	17.02	9.8	0.0050
25	Ft	17.02	10.5	0.0050
26	EWMA	17.36	8.0	0.0100
27	at	17.73	12.2	0.5000
28	DEWMA	19.68	9.4	0.0500
29	EWMA	21.98	27.5	0.0050
30	bt	25.12	44.4	0.0010
31	Shewhart	26.72	42.2	0.0050
32	Shewhart	26.78	42.6	0.0100
33	Shewhart	26.84	42.4	0.5000
34	Shewhart	27.16	43.0	0.2000
35	Shewhart	27.20	43.6	0.3000
36	Shewhart	27.28	43.4	0.0010
37	Ft	27.43	50.5	0.0010
38	Shewhart	27.46	44.1	0.0500
39	Shewhart	27.52	44.2	0.1000
40	Shewhart	27.79	45.0	0.0005
41	at	27.90	51.3	0.0010
42	bt	32.84	61.6	0.0005
43	at	34.65	65.0	0.0005
44	Ft	34.66	65.0	0.0005
45	bt	77.26	106.9	0.2000
46	EWMA	93.49	111.4	0.0010
47	EWMA	160.12	121.8	0.0005
48	Ft	170.00	120.5	0.5000
49	bt	188.39	118.2	0.3000
50	DEWMA	193.76	116.5	0.0100
51	DEWMA	234.51	88.9	0.0050
52	bt	243.96	77.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-12

	Chart	ARL1	SD	Lambda
1	EWMA	12.45	3.4	0.2000
2	Ft	12.55	3.4	0.1000
3	at	12.57	3.3	0.1000
4	DEWMA	12.65	3.3	0.3000
5	EWMA	12.75	3.3	0.1000
6	at	12.90	3.3	0.0500
7	Ft	12.91	3.3	0.0500
8	EWMA	12.98	3.6	0.3000
9	bt	13.04	3.5	0.0500
10	DEWMA	13.05	3.7	0.5000
11	DEWMA	13.13	3.3	0.2000
12	at	13.14	3.8	0.2000
13	Ft	13.33	4.0	0.2000
14	EWMA	13.46	3.5	0.0500
15	bt	13.66	4.9	0.1000
16	EWMA	14.10	4.1	0.5000
17	at	14.14	4.2	0.3000
18	bt	14.64	4.3	0.0100
19	Ft	14.72	5.3	0.3000
20	at	15.00	4.7	0.0100
21	Ft	15.02	4.7	0.0100
22	DEWMA	15.24	3.8	0.1000
23	bt	15.60	5.1	0.0050
24	Ft	15.91	6.9	0.0050
25	at	15.96	6.9	0.0050
26	at	16.10	7.0	0.5000
27	EWMA	16.42	5.8	0.0100
28	DEWMA	18.70	5.9	0.0500
29	EWMA	18.98	15.9	0.0050
30	Shewhart	19.91	20.8	0.5000
31	bt	20.05	29.6	0.0010
32	Shewhart	20.10	21.5	0.0100
33	Shewhart	20.19	22.6	0.0005
34	Shewhart	20.23	22.1	0.0500
35	Shewhart	20.26	22.3	0.0010
36	Shewhart	20.33	22.7	0.2000
37	Shewhart	20.40	22.8	0.3000
38	Shewhart	20.42	23.4	0.0050
39	Shewhart	20.46	23.8	0.1000
40	Ft	21.59	35.7	0.0010
41	at	21.84	36.2	0.0010
42	bt	23.85	42.0	0.0005
43	at	24.86	44.9	0.0005
44	Ft	25.12	45.7	0.0005
45	bt	53.05	88.1	0.2000
46	EWMA	72.85	99.2	0.0010
47	Ft	129.06	121.3	0.5000
48	EWMA	134.51	121.7	0.0005
49	bt	175.44	122.3	0.3000
50	DEWMA	187.46	118.7	0.0100
51	DEWMA	231.43	92.0	0.0050
52	bt	241.16	80.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-12

	Chart	ARL1	SD	Lambda
1	EWMA	12.45	3.4	0.2000
2	Ft	12.55	3.4	0.1000
3	at	12.57	3.3	0.1000
4	DEWMA	12.60	3.3	0.3000
5	EWMA	12.77	3.3	0.1000
6	Ft	12.89	3.4	0.0500
7	at	12.90	3.3	0.0500
8	EWMA	12.96	3.7	0.3000
9	bt	13.02	3.5	0.0500
10	DEWMA	13.05	3.7	0.5000
11	DEWMA	13.10	3.3	0.2000
12	at	13.15	3.8	0.2000
13	Ft	13.33	4.0	0.2000
14	EWMA	13.42	3.6	0.0500
15	bt	13.58	4.1	0.1000
16	EWMA	14.13	4.9	0.5000
17	at	14.15	4.3	0.3000
18	bt	14.68	4.3	0.0100
19	Ft	14.72	5.4	0.3000
20	at	15.07	4.6	0.0100
21	Ft	15.11	4.7	0.0100
22	DEWMA	15.24	3.8	0.1000
23	bt	15.58	5.2	0.0050
24	Ft	15.91	7.4	0.0050
25	at	15.96	7.4	0.0050
26	at	16.04	5.5	0.5000
27	EWMA	16.54	5.2	0.0100
28	DEWMA	18.69	6.9	0.0500
29	EWMA	19.12	16.9	0.0050
30	Shewhart	19.87	20.1	0.0005
31	bt	19.92	29.1	0.0010
32	Shewhart	19.97	20.7	0.0010
33	Shewhart	20.00	21.4	0.1000
34	Shewhart	20.18	22.1	0.0050
35	Shewhart	20.21	22.5	0.5000
36	Shewhart	20.23	22.7	0.0500
37	Shewhart	20.26	22.3	0.2000
38	Shewhart	20.26	22.6	0.3000
39	Shewhart	20.48	23.6	0.0100
40	Ft	21.35	34.9	0.0010
41	at	21.59	35.3	0.0010
42	bt	24.44	44.1	0.0005
43	Ft	25.65	47.4	0.0005
44	at	25.75	47.7	0.0005
45	bt	53.18	88.1	0.2000
46	EWMA	70.78	97.6	0.0010
47	Ft	127.45	121.1	0.5000
48	EWMA	133.21	121.6	0.0005
49	bt	174.52	122.6	0.3000
50	DEWMA	188.14	118.4	0.0100
51	DEWMA	229.54	93.6	0.0050
52	bt	240.52	81.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-13

	Chart	ARL1	SD	Lambda
1	EWMA	11.75	3.2	0.2000
2	Ft	11.85	3.2	0.1000
3	at	11.88	3.1	0.1000
4	DEWMA	11.94	3.1	0.3000
5	EWMA	12.11	3.1	0.1000
6	EWMA	12.14	3.4	0.3000
7	Ft	12.16	3.2	0.0500
8	at	12.18	3.1	0.0500
9	DEWMA	12.19	3.4	0.5000
10	bt	12.26	3.3	0.0500
11	at	12.30	3.5	0.2000
12	Ft	12.49	3.7	0.2000
13	DEWMA	12.51	3.0	0.2000
14	EWMA	12.74	3.3	0.0500
15	bt	12.76	3.8	0.1000
16	EWMA	13.08	3.9	0.5000
17	at	13.18	3.9	0.3000
18	Ft	13.67	4.3	0.3000
19	bt	13.93	4.2	0.0100
20	at	14.33	4.5	0.0100
21	Ft	14.35	4.5	0.0100
22	DEWMA	14.60	3.7	0.1000
23	bt	14.81	4.9	0.0050
24	at	14.81	4.6	0.5000
25	Ft	15.08	5.6	0.0050
26	at	15.13	5.6	0.0050
27	EWMA	15.69	5.0	0.0100
28	bt	17.01	18.5	0.0010
29	Shewhart	17.20	8.5	0.5000
30	Shewhart	17.36	9.2	0.3000
31	Shewhart	17.41	8.9	0.0100
32	Shewhart	17.43	9.2	0.0500
33	Shewhart	17.45	9.9	0.2000
34	Shewhart	17.47	9.5	0.0050
35	EWMA	17.49	9.6	0.0050
36	Shewhart	17.50	9.5	0.0010
37	Shewhart	17.51	9.2	0.1000
38	Shewhart	17.52	10.5	0.0005
39	Ft	17.79	23.3	0.0010
40	at	17.89	23.3	0.0010
41	DEWMA	17.92	5.1	0.0500
42	bt	19.60	30.1	0.0005
43	Ft	20.31	33.0	0.0005
44	at	20.33	33.0	0.0005
45	bt	35.32	66.6	0.2000
46	EWMA	50.96	79.1	0.0010
47	Ft	90.00	108.9	0.5000
48	EWMA	109.05	116.5	0.0005
49	bt	155.29	125.9	0.3000
50	DEWMA	180.03	120.9	0.0100
51	DEWMA	227.04	95.7	0.0050
52	bt	237.07	85.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-13

	Chart	ARL1	SD	Lambda
1	EWMA	11.74	3.2	0.2000
2	Ft	11.88	3.2	0.1000
3	at	11.88	3.1	0.1000
4	DEWMA	11.93	3.1	0.3000
5	EWMA	12.12	3.1	0.1000
6	EWMA	12.16	3.4	0.3000
7	DEWMA	12.27	3.4	0.5000
8	Ft	12.30	3.1	0.0500
9	at	12.31	3.1	0.0500
10	at	12.34	3.5	0.2000
11	bt	12.36	3.2	0.0500
12	Ft	12.47	3.7	0.2000
13	DEWMA	12.50	3.0	0.2000
14	bt	12.77	3.8	0.1000
15	EWMA	12.84	3.3	0.0500
16	at	13.16	4.0	0.3000
17	EWMA	13.27	3.8	0.5000
18	Ft	13.61	4.4	0.3000
19	bt	13.94	4.1	0.0100
20	at	14.31	4.4	0.0100
21	Ft	14.35	4.4	0.0100
22	DEWMA	14.64	3.6	0.1000
23	bt	14.81	5.0	0.0050
24	at	15.00	4.5	0.5000
25	Ft	15.08	5.7	0.0050
26	at	15.13	5.6	0.0050
27	EWMA	15.67	4.9	0.0100
28	Shewhart	17.34	9.5	0.0100
29	Shewhart	17.37	8.8	0.3000
30	Shewhart	17.39	9.2	0.0010
31	Shewhart	17.46	9.8	0.5000
32	Shewhart	17.46	10.2	0.0500
33	Shewhart	17.53	9.5	0.1000
34	Shewhart	17.53	10.2	0.2000
35	EWMA	17.53	9.3	0.0050
36	bt	17.54	20.7	0.0010
37	Shewhart	17.55	10.5	0.0005
38	Shewhart	17.57	10.5	0.0050
39	DEWMA	18.02	5.1	0.0500
40	Ft	18.44	25.9	0.0010
41	at	18.65	26.3	0.0010
42	bt	19.35	29.7	0.0005
43	Ft	20.19	33.2	0.0005
44	at	20.19	33.1	0.0005
45	bt	34.78	65.7	0.2000
46	EWMA	51.91	80.0	0.0010
47	Ft	91.76	109.9	0.5000
48	EWMA	104.43	114.8	0.0005
49	bt	154.79	126.0	0.3000
50	DEWMA	179.65	121.0	0.0100
51	DEWMA	228.72	94.2	0.0050
52	bt	237.02	85.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-14

	Chart	ARL1	SD	Lambda
1	EWMA	11.06	3.0	0.2000
2	Ft	11.27	2.9	0.1000
3	at	11.27	2.9	0.1000
4	DEWMA	11.36	2.8	0.3000
5	DEWMA	11.50	3.2	0.5000
6	EWMA	11.53	2.9	0.1000
7	at	11.55	3.3	0.2000
8	EWMA	11.57	3.1	0.3000
9	Ft	11.62	3.0	0.0500
10	at	11.64	3.0	0.0500
11	bt	11.67	3.1	0.0500
12	Ft	11.69	3.4	0.2000
13	DEWMA	11.86	2.9	0.2000
14	bt	11.96	3.5	0.1000
15	EWMA	12.18	3.2	0.0500
16	EWMA	12.41	3.6	0.5000
17	at	12.49	3.6	0.3000
18	Ft	12.91	4.0	0.3000
19	bt	13.25	4.0	0.0100
20	at	13.61	4.3	0.0100
21	Ft	13.64	4.3	0.0100
22	at	14.01	4.2	0.5000
23	DEWMA	14.10	3.4	0.1000
24	bt	14.14	4.7	0.0050
25	Ft	14.34	5.4	0.0050
26	at	14.40	5.4	0.0050
27	EWMA	14.92	4.8	0.0100
28	bt	15.77	11.7	0.0010
29	Shewhart	16.06	5.0	0.0010
30	Shewhart	16.08	4.9	0.1000
31	Shewhart	16.09	5.5	0.0005
32	Shewhart	16.12	6.1	0.0500
33	Shewhart	16.16	6.0	0.2000
34	Shewhart	16.18	4.9	0.3000
35	Ft	16.19	15.9	0.0010
36	Shewhart	16.19	6.5	0.0050
37	Shewhart	16.20	6.5	0.5000
38	Shewhart	16.24	6.0	0.0100
39	at	16.28	15.7	0.0010
40	EWMA	16.55	7.7	0.0050
41	DEWMA	17.38	5.5	0.0500
42	bt	17.43	22.8	0.0005
43	at	17.84	25.0	0.0005
44	Ft	18.01	26.0	0.0005
45	bt	25.21	48.7	0.2000
46	EWMA	39.07	62.8	0.0010
47	Ft	59.24	87.0	0.5000
48	EWMA	82.09	103.9	0.0005
49	bt	138.27	126.4	0.3000
50	DEWMA	171.18	123.1	0.0100
51	DEWMA	224.27	98.1	0.0050
52	bt	234.40	88.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-14

	Chart	ARL1	SD	Lambda
1	EWMA	11.09	3.0	0.2000
2	at	11.22	2.9	0.1000
3	Ft	11.22	3.0	0.1000
4	DEWMA	11.35	2.8	0.3000
5	EWMA	11.49	3.1	0.3000
6	EWMA	11.50	2.9	0.1000
7	DEWMA	11.54	3.2	0.5000
8	at	11.58	3.3	0.2000
9	Ft	11.64	3.0	0.0500
10	at	11.65	3.0	0.0500
11	Ft	11.68	3.4	0.2000
12	bt	11.70	3.1	0.0500
13	DEWMA	11.90	2.9	0.2000
14	bt	11.96	3.5	0.1000
15	EWMA	12.19	3.2	0.0500
16	at	12.36	3.6	0.3000
17	EWMA	12.41	3.6	0.5000
18	Ft	12.82	3.9	0.3000
19	bt	13.29	3.9	0.0100
20	at	13.63	4.2	0.0100
21	Ft	13.65	4.3	0.0100
22	at	14.00	4.2	0.5000
23	DEWMA	14.01	3.5	0.1000
24	bt	14.20	4.6	0.0050
25	Ft	14.48	5.4	0.0050
26	at	14.51	5.3	0.0050
27	EWMA	14.92	4.8	0.0100
28	bt	15.83	13.0	0.0010
29	Shewhart	16.10	4.9	0.3000
30	Shewhart	16.13	6.1	0.2000
31	Shewhart	16.14	6.1	0.0050
32	Shewhart	16.14	6.1	0.0500
33	Shewhart	16.17	5.5	0.5000
34	Shewhart	16.17	6.6	0.1000
35	Shewhart	16.18	6.0	0.0010
36	Shewhart	16.19	6.6	0.0100
37	Shewhart	16.23	4.8	0.0005
38	Ft	16.30	17.2	0.0010
39	at	16.46	17.6	0.0010
40	EWMA	16.61	5.7	0.0050
41	DEWMA	17.27	5.0	0.0500
42	bt	17.37	22.4	0.0005
43	Ft	17.86	25.0	0.0005
44	at	17.89	25.1	0.0005
45	bt	24.24	46.6	0.2000
46	EWMA	38.19	61.3	0.0010
47	Ft	60.46	88.2	0.5000
48	EWMA	83.23	104.7	0.0005
49	bt	137.82	126.4	0.3000
50	DEWMA	168.96	123.6	0.0100
51	DEWMA	225.50	97.0	0.0050
52	bt	235.00	87.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-15

	Chart	ARL1	SD	Lambda
1	EWMA	10.53	2.8	0.2000
2	at	10.70	2.8	0.1000
3	Ft	10.70	2.8	0.1000
4	DEWMA	10.83	2.7	0.3000
5	DEWMA	10.94	3.0	0.5000
6	EWMA	10.95	3.0	0.3000
7	at	10.97	3.1	0.2000
8	EWMA	10.98	2.8	0.1000
9	Ft	11.08	2.9	0.0500
10	Ft	11.08	3.2	0.2000
11	at	11.09	2.8	0.0500
12	bt	11.12	2.9	0.0500
13	bt	11.31	3.3	0.1000
14	DEWMA	11.41	2.7	0.2000
15	EWMA	11.64	3.1	0.0500
16	at	11.70	3.4	0.3000
17	EWMA	11.74	3.4	0.5000
18	Ft	12.09	3.7	0.3000
19	bt	12.75	3.7	0.0100
20	at	13.12	4.0	0.0100
21	Ft	13.14	4.0	0.0100
22	at	13.21	4.0	0.5000
23	DEWMA	13.53	3.4	0.1000
24	bt	13.59	4.5	0.0050
25	Ft	13.80	5.2	0.0050
26	at	13.85	5.1	0.0050
27	EWMA	14.38	4.5	0.0100
28	bt	15.01	9.1	0.0010
29	Shewhart	15.14	4.6	0.2000
30	Shewhart	15.16	4.5	0.5000
31	Shewhart	15.16	4.6	0.0100
32	Shewhart	15.17	5.2	0.0005
33	Ft	15.17	11.3	0.0010
34	Shewhart	15.18	4.6	0.0050
35	Shewhart	15.19	4.5	0.0010
36	Shewhart	15.20	4.6	0.0500
37	Shewhart	15.20	4.6	0.3000
38	Shewhart	15.24	4.5	0.1000
39	at	15.30	11.5	0.0010
40	EWMA	15.86	5.5	0.0050
41	bt	15.87	16.3	0.0005
42	Ft	15.98	17.2	0.0005
43	at	16.05	17.5	0.0005
44	DEWMA	16.74	4.8	0.0500
45	bt	18.25	30.7	0.2000
46	EWMA	31.10	48.2	0.0010
47	Ft	40.17	64.0	0.5000
48	EWMA	64.78	91.4	0.0005
49	bt	119.33	124.3	0.3000
50	DEWMA	162.82	124.4	0.0100
51	DEWMA	222.01	99.7	0.0050
52	bt	230.30	92.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-15

	Chart	ARL1	SD	Lambda
1	EWMA	10.58	2.8	0.2000
2	Ft	10.70	2.8	0.1000
3	at	10.71	2.7	0.1000
4	DEWMA	10.86	2.7	0.3000
5	DEWMA	10.94	3.0	0.5000
6	EWMA	10.96	3.0	0.3000
7	EWMA	10.99	2.7	0.1000
8	at	11.03	3.0	0.2000
9	at	11.11	2.8	0.0500
10	Ft	11.11	2.9	0.0500
11	bt	11.14	2.9	0.0500
12	Ft	11.14	3.2	0.2000
13	bt	11.28	3.3	0.1000
14	DEWMA	11.43	2.7	0.2000
15	EWMA	11.62	3.1	0.0500
16	at	11.72	3.4	0.3000
17	EWMA	11.77	3.4	0.5000
18	Ft	12.10	3.8	0.3000
19	bt	12.75	3.8	0.0100
20	at	13.08	4.1	0.0100
21	Ft	13.11	4.1	0.0100
22	at	13.26	3.9	0.5000
23	DEWMA	13.55	3.3	0.1000
24	bt	13.59	4.5	0.0050
25	Ft	13.79	5.2	0.0050
26	at	13.83	5.1	0.0050
27	EWMA	14.35	4.6	0.0100
28	bt	14.86	9.5	0.0010
29	Ft	14.99	11.3	0.0010
30	at	15.08	11.3	0.0010
31	Shewhart	15.17	4.6	0.1000
32	Shewhart	15.17	4.5	0.0500
33	Shewhart	15.19	4.6	0.3000
34	Shewhart	15.21	4.5	0.5000
35	Shewhart	15.22	4.6	0.0010
36	Shewhart	15.22	4.5	0.2000
37	Shewhart	15.24	4.5	0.0005
38	Shewhart	15.24	4.5	0.0050
39	Shewhart	15.26	5.2	0.0100
40	bt	15.79	14.8	0.0005
41	EWMA	15.83	5.5	0.0050
42	Ft	16.09	17.3	0.0005
43	at	16.13	17.5	0.0005
44	DEWMA	16.71	4.8	0.0500
45	bt	18.22	30.4	0.2000
46	EWMA	30.97	48.1	0.0010
47	Ft	39.62	63.0	0.5000
48	EWMA	62.64	89.2	0.0005
49	bt	117.49	123.9	0.3000
50	DEWMA	162.30	124.4	0.0100
51	DEWMA	220.65	100.8	0.0050
52	bt	232.34	90.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-16

	Chart	ARL1	SD	Lambda
1	EWMA	10.10	2.7	0.2000
2	Ft	10.24	2.7	0.1000
3	at	10.26	2.6	0.1000
4	DEWMA	10.35	2.6	0.3000
5	EWMA	10.37	2.8	0.3000
6	DEWMA	10.42	2.8	0.5000
7	at	10.44	2.9	0.2000
8	Ft	10.54	3.0	0.2000
9	EWMA	10.58	2.6	0.1000
10	bt	10.68	2.8	0.0500
11	Ft	10.69	2.7	0.0500
12	at	10.70	2.7	0.0500
13	bt	10.81	3.0	0.1000
14	DEWMA	11.01	2.6	0.2000
15	at	11.11	3.2	0.3000
16	EWMA	11.16	3.2	0.5000
17	EWMA	11.24	2.9	0.0500
18	Ft	11.43	3.5	0.3000
19	bt	12.26	3.7	0.0100
20	at	12.54	3.7	0.5000
21	at	12.66	3.9	0.0100
22	Ft	12.69	3.9	0.0100
23	bt	13.15	4.3	0.0050
24	DEWMA	13.17	3.2	0.1000
25	Ft	13.40	5.0	0.0050
26	at	13.45	4.9	0.0050
27	EWMA	13.91	4.3	0.0100
28	Shewhart	14.30	4.3	0.0050
29	Shewhart	14.33	4.3	0.0010
30	Shewhart	14.34	4.3	0.3000
31	Shewhart	14.36	4.3	0.2000
32	Shewhart	14.37	4.3	0.0100
33	Shewhart	14.38	4.3	0.5000
34	Shewhart	14.38	4.3	0.1000
35	Shewhart	14.41	4.3	0.0500
36	bt	14.42	8.1	0.0010
37	Shewhart	14.44	4.3	0.0005
38	bt	14.57	15.6	0.2000
39	Ft	14.60	10.5	0.0010
40	bt	14.69	10.0	0.0005
41	at	14.70	10.5	0.0010
42	Ft	14.95	12.9	0.0005
43	at	14.96	12.9	0.0005
44	EWMA	15.42	5.8	0.0050
45	DEWMA	16.32	4.6	0.0500
46	EWMA	25.95	35.5	0.0010
47	Ft	27.86	39.6	0.5000
48	EWMA	46.93	71.9	0.0005
49	bt	100.50	119.3	0.3000
50	DEWMA	156.74	124.9	0.0100
51	DEWMA	221.28	100.2	0.0050
52	bt	226.03	96.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-16

	Chart	ARL1	SD	Lambda
1	EWMA	10.09	2.7	0.2000
2	Ft	10.24	2.7	0.1000
3	at	10.25	2.6	0.1000
4	DEWMA	10.38	2.5	0.3000
5	DEWMA	10.38	2.8	0.5000
6	EWMA	10.41	2.8	0.3000
7	at	10.44	2.9	0.2000
8	EWMA	10.52	2.6	0.1000
9	Ft	10.53	3.0	0.2000
10	bt	10.66	2.7	0.0500
11	Ft	10.67	2.7	0.0500
12	at	10.67	2.7	0.0500
13	bt	10.84	3.0	0.1000
14	DEWMA	10.99	2.6	0.2000
15	EWMA	11.11	3.2	0.5000
16	at	11.14	3.2	0.3000
17	EWMA	11.19	2.9	0.0500
18	Ft	11.45	3.5	0.3000
19	bt	12.27	3.6	0.0100
20	at	12.53	3.8	0.5000
21	at	12.65	3.9	0.0100
22	Ft	12.67	3.9	0.0100
23	DEWMA	13.09	3.2	0.1000
24	bt	13.20	4.3	0.0050
25	Ft	13.43	5.0	0.0050
26	at	13.48	4.9	0.0050
27	EWMA	13.87	4.4	0.0100
28	bt	14.25	6.9	0.0010
29	Ft	14.33	8.1	0.0010
30	Shewhart	14.36	4.3	0.0050
31	Shewhart	14.37	4.3	0.0005
32	Shewhart	14.37	4.3	0.0100
33	Shewhart	14.38	4.3	0.2000
34	Shewhart	14.40	4.3	0.1000
35	at	14.41	8.0	0.0010
36	Shewhart	14.42	4.3	0.3000
37	Shewhart	14.43	4.3	0.0010
38	Shewhart	14.44	4.2	0.0500
39	Shewhart	14.45	4.3	0.5000
40	bt	14.81	10.2	0.0005
41	bt	14.88	18.1	0.2000
42	at	14.92	11.3	0.0005
43	Ft	14.93	11.5	0.0005
44	EWMA	15.42	5.2	0.0050
45	DEWMA	16.24	4.7	0.0500
46	EWMA	25.53	34.3	0.0010
47	Ft	27.84	39.4	0.5000
48	EWMA	46.56	71.3	0.0005
49	bt	99.81	119.0	0.3000
50	DEWMA	155.46	125.1	0.0100
51	DEWMA	219.74	101.3	0.0050
52	bt	226.89	95.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-17

	Chart	ARL1	SD	Lambda
1	EWMA	9.67	2.5	0.2000
2	Ft	9.87	2.5	0.1000
3	at	9.87	2.5	0.1000
4	EWMA	9.93	2.7	0.3000
5	DEWMA	9.97	2.6	0.5000
6	DEWMA	9.98	2.5	0.3000
7	at	10.00	2.7	0.2000
8	Ft	10.07	2.8	0.2000
9	EWMA	10.16	2.5	0.1000
10	bt	10.24	2.6	0.0500
11	Ft	10.29	2.6	0.0500
12	at	10.29	2.6	0.0500
13	bt	10.31	2.9	0.1000
14	at	10.54	3.0	0.3000
15	DEWMA	10.61	2.5	0.2000
16	EWMA	10.65	3.0	0.5000
17	EWMA	10.81	2.8	0.0500
18	Ft	10.84	3.3	0.3000
19	bt	11.82	3.5	0.0100
20	at	11.89	3.5	0.5000
21	at	12.18	3.8	0.0100
22	Ft	12.20	3.8	0.0100
23	bt	12.76	4.2	0.0050
24	DEWMA	12.77	3.0	0.1000
25	bt	12.94	7.4	0.2000
26	Ft	12.97	4.8	0.0050
27	at	13.01	4.8	0.0050
28	EWMA	13.35	4.2	0.0100
29	Shewhart	13.61	4.0	0.0100
30	Shewhart	13.64	4.0	0.2000
31	Shewhart	13.64	4.1	0.0010
32	Shewhart	13.65	4.0	0.3000
33	Shewhart	13.65	4.1	0.1000
34	Shewhart	13.66	4.0	0.0050
35	Shewhart	13.68	4.1	0.0500
36	Shewhart	13.69	4.0	0.0005
37	Shewhart	13.70	4.0	0.5000
38	bt	13.73	7.1	0.0010
39	Ft	13.76	7.3	0.0010
40	at	13.84	7.3	0.0010
41	bt	14.16	8.8	0.0005
42	Ft	14.21	9.6	0.0005
43	at	14.24	9.6	0.0005
44	EWMA	14.88	5.1	0.0050
45	DEWMA	15.88	4.5	0.0500
46	EWMA	22.24	23.0	0.0010
47	Ft	22.56	24.0	0.5000
48	EWMA	36.46	55.6	0.0005
49	bt	82.00	111.2	0.3000
50	DEWMA	144.61	125.4	0.0100
51	DEWMA	215.88	104.1	0.0050
52	bt	221.37	99.9	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-17

	Chart	ARL1	SD	Lambda
1	EWMA	9.68	2.5	0.2000
2	Ft	9.84	2.5	0.1000
3	at	9.86	2.5	0.1000
4	EWMA	9.98	2.7	0.3000
5	DEWMA	9.99	2.5	0.3000
6	DEWMA	10.00	2.7	0.5000
7	at	10.00	2.7	0.2000
8	Ft	10.11	2.9	0.2000
9	EWMA	10.16	2.5	0.1000
10	bt	10.25	2.6	0.0500
11	Ft	10.28	2.6	0.0500
12	at	10.30	2.5	0.0500
13	bt	10.35	2.9	0.1000
14	DEWMA	10.61	2.5	0.2000
15	at	10.62	3.0	0.3000
16	EWMA	10.65	3.0	0.5000
17	EWMA	10.84	2.7	0.0500
18	Ft	10.93	3.3	0.3000
19	bt	11.88	3.5	0.0100
20	at	11.93	3.5	0.5000
21	at	12.21	3.7	0.0100
22	Ft	12.24	3.7	0.0100
23	bt	12.67	4.2	0.0050
24	DEWMA	12.75	3.1	0.1000
25	Ft	12.93	4.8	0.0050
26	at	12.98	4.8	0.0050
27	bt	13.13	8.4	0.2000
28	EWMA	13.38	4.2	0.0100
29	Shewhart	13.62	4.1	0.2000
30	Shewhart	13.62	4.0	0.0500
31	Shewhart	13.65	4.0	0.0010
32	Shewhart	13.67	4.0	0.0005
33	Shewhart	13.67	4.0	0.5000
34	Shewhart	13.67	4.0	0.0050
35	Shewhart	13.67	4.0	0.0100
36	Shewhart	13.71	4.0	0.1000
37	Shewhart	13.74	4.0	0.3000
38	bt	13.77	7.0	0.0010
39	Ft	13.81	7.3	0.0010
40	at	13.89	7.3	0.0010
41	bt	14.15	8.0	0.0005
42	Ft	14.19	8.5	0.0005
43	at	14.20	8.5	0.0005
44	EWMA	14.85	5.1	0.0050
45	DEWMA	15.89	4.4	0.0500
46	EWMA	22.03	21.5	0.0010
47	Ft	22.61	24.0	0.5000
48	EWMA	37.04	56.6	0.0005
49	bt	82.70	111.6	0.3000
50	DEWMA	144.66	125.4	0.0100
51	DEWMA	217.40	103.1	0.0050
52	bt	223.19	98.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-18

	Chart	ARL1	SD	Lambda
1	EWMA	9.30	2.4	0.2000
2	at	9.46	2.4	0.1000
3	Ft	9.46	2.4	0.1000
4	DEWMA	9.51	2.6	0.5000
5	at	9.58	2.6	0.2000
6	EWMA	9.61	2.5	0.3000
7	DEWMA	9.64	2.3	0.3000
8	Ft	9.65	2.7	0.2000
9	EWMA	9.75	2.5	0.1000
10	bt	9.85	2.5	0.0500
11	bt	9.89	2.7	0.1000
12	Ft	9.92	2.5	0.0500
13	at	9.93	2.4	0.0500
14	EWMA	10.12	2.9	0.5000
15	at	10.17	2.9	0.3000
16	DEWMA	10.27	2.4	0.2000
17	Ft	10.45	3.1	0.3000
18	EWMA	10.45	2.6	0.0500
19	at	11.27	3.4	0.5000
20	bt	11.49	3.4	0.0100
21	at	11.80	3.6	0.0100
22	Ft	11.83	3.7	0.0100
23	bt	12.14	6.8	0.2000
24	bt	12.28	4.0	0.0050
25	DEWMA	12.35	3.1	0.1000
26	Ft	12.51	4.6	0.0050
27	at	12.55	4.6	0.0050
28	EWMA	12.93	4.1	0.0100
29	Shewhart	12.95	3.8	0.5000
30	Shewhart	12.96	3.9	0.0500
31	Shewhart	12.98	3.8	0.2000
32	Shewhart	13.01	3.8	0.0050
33	Shewhart	13.02	3.9	0.1000
34	Shewhart	13.05	3.8	0.3000
35	Shewhart	13.05	3.9	0.0100
36	Shewhart	13.06	3.8	0.0005
37	Shewhart	13.06	3.8	0.0010
38	bt	13.41	6.9	0.0010
39	Ft	13.49	8.0	0.0010
40	at	13.58	8.0	0.0010
41	bt	13.68	7.7	0.0005
42	Ft	13.69	7.9	0.0005
43	at	13.71	7.9	0.0005
44	EWMA	14.37	4.9	0.0050
45	DEWMA	15.50	4.3	0.0500
46	Ft	19.93	12.8	0.5000
47	EWMA	20.66	16.4	0.0010
48	EWMA	30.61	43.5	0.0005
49	bt	65.69	100.9	0.3000
50	DEWMA	137.02	125.1	0.0100
51	DEWMA	214.85	104.6	0.0050
52	bt	218.67	102.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-18

	Chart	ARL1	SD	Lambda
1	EWMA	9.34	2.4	0.2000
2	Ft	9.44	2.4	0.1000
3	at	9.45	2.4	0.1000
4	DEWMA	9.54	2.6	0.5000
5	EWMA	9.55	2.5	0.3000
6	DEWMA	9.61	2.4	0.3000
7	at	9.62	2.6	0.2000
8	Ft	9.69	2.7	0.2000
9	EWMA	9.75	2.4	0.1000
10	bt	9.87	2.7	0.1000
11	bt	9.88	2.5	0.0500
12	Ft	9.92	2.5	0.0500
13	at	9.94	2.5	0.0500
14	at	10.12	2.9	0.3000
15	EWMA	10.15	2.9	0.5000
16	DEWMA	10.31	2.4	0.2000
17	Ft	10.39	3.1	0.3000
18	EWMA	10.45	2.7	0.0500
19	at	11.28	3.4	0.5000
20	bt	11.41	3.4	0.0100
21	at	11.71	3.7	0.0100
22	Ft	11.73	3.8	0.0100
23	bt	12.16	5.7	0.2000
24	bt	12.25	4.0	0.0050
25	DEWMA	12.35	3.1	0.1000
26	Ft	12.48	4.6	0.0050
27	at	12.52	4.6	0.0050
28	EWMA	12.86	4.2	0.0100
29	Shewhart	12.95	3.9	0.5000
30	Shewhart	12.97	3.9	0.3000
31	Shewhart	13.01	3.8	0.1000
32	Shewhart	13.01	3.9	0.0050
33	Shewhart	13.03	3.9	0.0100
34	Shewhart	13.04	3.9	0.0010
35	Shewhart	13.05	3.9	0.0500
36	Shewhart	13.10	3.8	0.2000
37	Shewhart	13.10	3.8	0.0005
38	bt	13.25	6.4	0.0010
39	Ft	13.28	6.7	0.0010
40	at	13.37	6.7	0.0010
41	bt	13.70	7.3	0.0005
42	Ft	13.73	7.8	0.0005
43	at	13.77	8.3	0.0005
44	EWMA	14.33	4.9	0.0050
45	DEWMA	15.48	4.3	0.0500
46	Ft	19.79	12.3	0.5000
47	EWMA	20.49	15.9	0.0010
48	EWMA	30.48	43.1	0.0005
49	bt	65.34	100.7	0.3000
50	DEWMA	135.99	125.1	0.0100
51	DEWMA	213.75	105.4	0.0050
52	bt	216.48	103.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-19

	Chart	ARL1	SD	Lambda
1	EWMA	8.99	2.3	0.2000
2	Ft	9.16	2.3	0.1000
3	EWMA	9.16	2.4	0.3000
4	at	9.18	2.3	0.1000
5	DEWMA	9.18	2.4	0.5000
6	at	9.22	2.4	0.2000
7	DEWMA	9.27	2.2	0.3000
8	Ft	9.28	2.5	0.2000
9	EWMA	9.50	2.3	0.1000
10	bt	9.50	2.6	0.1000
11	bt	9.60	2.4	0.0500
12	Ft	9.63	2.4	0.0500
13	at	9.64	2.4	0.0500
14	at	9.69	2.8	0.3000
15	EWMA	9.76	2.7	0.5000
16	Ft	9.94	3.0	0.3000
17	DEWMA	9.98	2.3	0.2000
18	EWMA	10.13	2.6	0.0500
19	at	10.84	3.2	0.5000
20	bt	11.11	3.2	0.0100
21	bt	11.42	4.0	0.2000
22	at	11.43	3.5	0.0100
23	Ft	11.44	3.6	0.0100
24	bt	11.84	3.9	0.0050
25	Ft	12.06	4.5	0.0050
26	DEWMA	12.08	2.9	0.1000
27	at	12.09	4.5	0.0050
28	Shewhart	12.38	3.6	0.0100
29	Shewhart	12.40	3.6	0.3000
30	Shewhart	12.43	3.7	0.0005
31	Shewhart	12.44	3.7	0.5000
32	Shewhart	12.45	3.7	0.1000
33	Shewhart	12.45	3.7	0.0050
34	Shewhart	12.47	3.7	0.0010
35	Shewhart	12.47	3.7	0.2000
36	EWMA	12.53	4.0	0.0100
37	Shewhart	12.53	3.7	0.0500
38	bt	12.88	6.2	0.0010
39	Ft	12.90	6.5	0.0010
40	at	12.98	6.5	0.0010
41	bt	13.15	6.7	0.0005
42	Ft	13.16	6.9	0.0005
43	at	13.18	6.8	0.0005
44	EWMA	13.85	4.8	0.0050
45	DEWMA	15.07	4.3	0.0500
46	Ft	18.48	7.0	0.5000
47	EWMA	19.34	10.1	0.0010
48	EWMA	25.63	29.2	0.0005
49	bt	50.25	87.6	0.3000
50	DEWMA	128.65	124.2	0.0100
51	DEWMA	209.94	107.7	0.0050
52	bt	213.67	105.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-19

	Chart	ARL1	SD	Lambda
1	EWMA	8.95	2.4	0.2000
2	Ft	9.11	2.3	0.1000
3	DEWMA	9.13	2.4	0.5000
4	at	9.13	2.3	0.1000
5	EWMA	9.16	2.4	0.3000
6	at	9.16	2.5	0.2000
7	Ft	9.21	2.6	0.2000
8	DEWMA	9.27	2.2	0.3000
9	EWMA	9.42	2.3	0.1000
10	bt	9.50	2.6	0.1000
11	bt	9.55	2.4	0.0500
12	Ft	9.61	2.4	0.0500
13	at	9.61	2.4	0.0500
14	at	9.64	2.7	0.3000
15	EWMA	9.70	2.7	0.5000
16	Ft	9.89	2.9	0.3000
17	DEWMA	9.94	2.4	0.2000
18	EWMA	10.12	2.6	0.0500
19	at	10.80	3.2	0.5000
20	bt	11.12	3.3	0.0100
21	bt	11.44	5.4	0.2000
22	at	11.46	3.5	0.0100
23	Ft	11.47	3.6	0.0100
24	bt	11.91	4.0	0.0050
25	DEWMA	12.01	2.9	0.1000
26	Ft	12.09	4.6	0.0050
27	at	12.15	4.5	0.0050
28	Shewhart	12.37	3.7	0.0010
29	Shewhart	12.38	3.6	0.5000
30	Shewhart	12.41	3.7	0.1000
31	Shewhart	12.42	3.6	0.2000
32	Shewhart	12.43	3.6	0.3000
33	Shewhart	12.46	3.6	0.0100
34	Shewhart	12.50	3.6	0.0500
35	Shewhart	12.50	3.6	0.0050
36	Shewhart	12.51	3.6	0.0005
37	EWMA	12.57	4.0	0.0100
38	bt	12.84	6.3	0.0010
39	Ft	12.86	6.6	0.0010
40	at	12.94	6.5	0.0010
41	bt	13.25	7.1	0.0005
42	Ft	13.26	7.3	0.0005
43	at	13.27	7.3	0.0005
44	EWMA	13.89	4.8	0.0050
45	DEWMA	15.09	4.2	0.0500
46	Ft	18.41	6.5	0.5000
47	EWMA	19.22	9.1	0.0010
48	EWMA	26.31	32.0	0.0005
49	bt	52.29	89.7	0.3000
50	DEWMA	129.29	124.1	0.0100
51	DEWMA	208.85	108.3	0.0050
52	bt	213.09	106.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-20

	Chart	ARL1	SD	Lambda
1	EWMA	8.72	2.2	0.2000
2	Ft	8.82	2.2	0.1000
3	at	8.85	2.1	0.1000
4	DEWMA	8.86	2.3	0.5000
5	EWMA	8.88	2.3	0.3000
6	at	8.92	2.4	0.2000
7	Ft	8.98	2.5	0.2000
8	DEWMA	9.02	2.1	0.3000
9	bt	9.15	2.4	0.1000
10	EWMA	9.15	2.2	0.1000
11	bt	9.26	2.3	0.0500
12	Ft	9.31	2.3	0.0500
13	at	9.32	2.3	0.0500
14	at	9.35	2.6	0.3000
15	EWMA	9.37	2.6	0.5000
16	Ft	9.58	2.8	0.3000
17	DEWMA	9.74	2.3	0.2000
18	EWMA	9.82	2.5	0.0500
19	at	10.44	3.0	0.5000
20	bt	10.79	3.2	0.0100
21	bt	10.88	3.8	0.2000
22	at	11.09	3.5	0.0100
23	Ft	11.11	3.5	0.0100
24	bt	11.64	3.7	0.0050
25	DEWMA	11.77	2.8	0.1000
26	Shewhart	11.87	3.5	0.0050
27	Shewhart	11.88	3.5	0.0005
28	Ft	11.89	4.3	0.0050
29	Shewhart	11.92	3.4	0.1000
30	Shewhart	11.92	3.5	0.0010
31	Shewhart	11.92	3.5	0.2000
32	Shewhart	11.92	3.5	0.0100
33	Shewhart	11.93	3.5	0.0500
34	at	11.93	4.3	0.0050
35	Shewhart	11.94	3.5	0.3000
36	Shewhart	11.96	3.5	0.5000
37	EWMA	12.16	3.9	0.0100
38	bt	12.54	6.0	0.0010
39	Ft	12.56	6.3	0.0010
40	at	12.63	6.3	0.0010
41	bt	12.86	6.5	0.0005
42	Ft	12.87	6.7	0.0005
43	at	12.89	6.7	0.0005
44	EWMA	13.69	4.5	0.0050
45	DEWMA	14.78	4.1	0.0500
46	Ft	17.53	4.6	0.5000
47	EWMA	18.69	8.3	0.0010
48	EWMA	23.77	23.2	0.0005
49	bt	40.21	76.1	0.3000
50	DEWMA	118.43	122.1	0.0100
51	bt	207.12	109.6	0.5000
52	DEWMA	210.77	107.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-20

	Chart	ARL1	SD	Lambda
1	EWMA	8.66	2.2	0.2000
2	Ft	8.80	2.2	0.1000
3	at	8.81	2.2	0.1000
4	EWMA	8.84	2.3	0.3000
5	DEWMA	8.84	2.4	0.5000
6	at	8.84	2.4	0.2000
7	Ft	8.91	2.4	0.2000
8	DEWMA	9.02	2.1	0.3000
9	EWMA	9.12	2.2	0.1000
10	bt	9.16	2.5	0.1000
11	bt	9.27	2.3	0.0500
12	at	9.28	2.6	0.3000
13	Ft	9.32	2.3	0.0500
14	at	9.33	2.3	0.0500
15	EWMA	9.35	2.6	0.5000
16	Ft	9.49	2.8	0.3000
17	DEWMA	9.70	2.2	0.2000
18	EWMA	9.83	2.5	0.0500
19	at	10.39	3.1	0.5000
20	bt	10.80	3.1	0.0100
21	bt	10.85	3.8	0.2000
22	at	11.11	3.4	0.0100
23	Ft	11.13	3.4	0.0100
24	bt	11.57	3.8	0.0050
25	DEWMA	11.72	2.8	0.1000
26	Ft	11.80	4.3	0.0050
27	at	11.84	4.3	0.0050
28	Shewhart	11.87	3.5	0.3000
29	Shewhart	11.88	3.5	0.0050
30	Shewhart	11.90	3.5	0.0005
31	Shewhart	11.91	3.5	0.5000
32	Shewhart	11.92	3.5	0.1000
33	Shewhart	11.92	3.5	0.0010
34	Shewhart	11.93	3.5	0.0100
35	Shewhart	11.95	3.5	0.2000
36	Shewhart	11.95	3.4	0.0500
37	EWMA	12.19	3.9	0.0100
38	bt	12.55	6.0	0.0010
39	Ft	12.57	6.3	0.0010
40	at	12.65	6.3	0.0010
41	bt	12.94	6.4	0.0005
42	Ft	12.96	6.6	0.0005
43	at	12.97	6.5	0.0005
44	EWMA	13.57	4.6	0.0050
45	DEWMA	14.76	4.2	0.0500
46	Ft	17.44	4.7	0.5000
47	EWMA	18.64	7.0	0.0010
48	EWMA	23.59	22.0	0.0005
49	bt	37.93	73.3	0.3000
50	DEWMA	120.46	122.6	0.0100
51	bt	207.56	109.4	0.5000
52	DEWMA	208.71	108.3	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-21

	Chart	ARL1	SD	Lambda
1	EWMA	8.43	2.1	0.2000
2	EWMA	8.50	2.2	0.3000
3	Ft	8.55	2.1	0.1000
4	at	8.56	2.1	0.1000
5	DEWMA	8.57	2.2	0.5000
6	at	8.59	2.3	0.2000
7	Ft	8.66	2.3	0.2000
8	DEWMA	8.71	2.1	0.3000
9	bt	8.83	2.4	0.1000
10	EWMA	8.86	2.2	0.1000
11	at	8.93	2.5	0.3000
12	bt	8.98	2.2	0.0500
13	EWMA	9.05	2.5	0.5000
14	Ft	9.05	2.2	0.0500
15	at	9.06	2.2	0.0500
16	Ft	9.13	2.7	0.3000
17	DEWMA	9.45	2.2	0.2000
18	EWMA	9.55	2.4	0.0500
19	at	9.98	2.9	0.5000
20	bt	10.36	3.5	0.2000
21	bt	10.47	3.0	0.0100
22	at	10.76	3.3	0.0100
23	Ft	10.77	3.3	0.0100
24	bt	11.26	3.7	0.0050
25	Shewhart	11.43	3.4	0.3000
26	Shewhart	11.43	3.3	0.0500
27	Shewhart	11.45	3.3	0.0050
28	Shewhart	11.46	3.3	0.5000
29	Shewhart	11.46	3.3	0.0100
30	DEWMA	11.47	2.8	0.1000
31	Shewhart	11.48	3.3	0.1000
32	Shewhart	11.49	3.3	0.2000
33	Ft	11.51	4.2	0.0050
34	Shewhart	11.51	3.3	0.0005
35	Shewhart	11.51	3.3	0.0010
36	at	11.55	4.2	0.0050
37	EWMA	11.81	3.7	0.0100
38	bt	12.27	5.9	0.0010
39	Ft	12.30	6.2	0.0010
40	at	12.37	6.1	0.0010
41	bt	12.54	6.3	0.0005
42	Ft	12.55	6.5	0.0005
43	at	12.57	6.4	0.0005
44	EWMA	13.23	4.5	0.0050
45	DEWMA	14.45	4.1	0.0500
46	Ft	16.66	3.7	0.5000
47	EWMA	18.16	5.4	0.0010
48	EWMA	22.07	15.7	0.0005
49	bt	29.64	60.9	0.3000
50	DEWMA	111.19	120.4	0.0100
51	bt	201.89	112.6	0.5000
52	DEWMA	204.51	110.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-21

	Chart	ARL1	SD	Lambda
1	EWMA	8.36	2.1	0.2000
2	at	8.53	2.2	0.2000
3	DEWMA	8.54	2.2	0.5000
4	Ft	8.55	2.1	0.1000
5	at	8.56	2.1	0.1000
6	EWMA	8.56	2.2	0.3000
7	Ft	8.57	2.3	0.2000
8	DEWMA	8.73	2.1	0.3000
9	bt	8.84	2.3	0.1000
10	EWMA	8.90	2.2	0.1000
11	bt	8.95	2.2	0.0500
12	at	8.97	2.5	0.3000
13	Ft	9.02	2.3	0.0500
14	at	9.02	2.2	0.0500
15	EWMA	9.03	2.5	0.5000
16	Ft	9.16	2.7	0.3000
17	DEWMA	9.42	2.2	0.2000
18	EWMA	9.51	2.5	0.0500
19	at	10.00	2.9	0.5000
20	bt	10.28	3.5	0.2000
21	bt	10.47	3.1	0.0100
22	at	10.79	3.4	0.0100
23	Ft	10.81	3.4	0.0100
24	bt	11.33	3.6	0.0050
25	Shewhart	11.39	3.4	0.3000
26	Shewhart	11.41	3.4	0.2000
27	Shewhart	11.44	3.3	0.1000
28	Shewhart	11.44	3.4	0.0500
29	Shewhart	11.45	3.3	0.0100
30	Shewhart	11.46	3.3	0.0050
31	Shewhart	11.47	3.3	0.0010
32	Shewhart	11.49	3.3	0.0005
33	Shewhart	11.50	3.4	0.5000
34	DEWMA	11.52	2.8	0.1000
35	Ft	11.54	4.2	0.0050
36	at	11.59	4.2	0.0050
37	EWMA	11.84	3.8	0.0100
38	bt	12.33	5.8	0.0010
39	Ft	12.36	6.1	0.0010
40	bt	12.42	6.4	0.0005
41	at	12.43	6.0	0.0010
42	Ft	12.44	6.5	0.0005
43	at	12.45	6.5	0.0005
44	EWMA	13.24	4.5	0.0050
45	DEWMA	14.43	4.0	0.0500
46	Ft	16.71	3.8	0.5000
47	EWMA	18.15	4.7	0.0010
48	EWMA	21.92	15.1	0.0005
49	bt	30.53	62.6	0.3000
50	DEWMA	112.20	120.6	0.0100
51	bt	202.61	112.1	0.5000
52	DEWMA	204.56	110.7	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-22

	Chart	ARL1	SD	Lambda
1	EWMA	8.11	2.0	0.2000
2	DEWMA	8.22	2.2	0.5000
3	at	8.25	2.2	0.2000
4	EWMA	8.26	2.1	0.3000
5	Ft	8.29	2.2	0.2000
6	Ft	8.32	2.0	0.1000
7	at	8.33	2.0	0.1000
8	DEWMA	8.50	2.0	0.3000
9	bt	8.57	2.2	0.1000
10	at	8.64	2.4	0.3000
11	EWMA	8.64	2.0	0.1000
12	EWMA	8.68	2.4	0.5000
13	bt	8.72	2.1	0.0500
14	Ft	8.79	2.1	0.0500
15	at	8.80	2.1	0.0500
16	Ft	8.83	2.6	0.3000
17	DEWMA	9.20	2.1	0.2000
18	EWMA	9.28	2.3	0.0500
19	at	9.57	2.8	0.5000
20	bt	9.84	3.3	0.2000
21	bt	10.24	3.0	0.0100
22	at	10.54	3.2	0.0100
23	Ft	10.57	3.2	0.0100
24	bt	10.96	3.6	0.0050
25	Shewhart	10.97	3.2	0.0005
26	Shewhart	10.97	3.2	0.5000
27	Shewhart	10.98	3.2	0.0500
28	Shewhart	11.00	3.2	0.1000
29	Shewhart	11.00	3.2	0.3000
30	Shewhart	11.01	3.1	0.0050
31	Shewhart	11.01	3.2	0.2000
32	Shewhart	11.02	3.2	0.0100
33	Shewhart	11.04	3.2	0.0010
34	Ft	11.18	4.1	0.0050
35	at	11.21	4.1	0.0050
36	DEWMA	11.23	2.7	0.1000
37	EWMA	11.59	3.6	0.0100
38	bt	11.91	5.7	0.0010
39	Ft	11.93	6.0	0.0010
40	at	12.01	5.9	0.0010
41	Ft	12.25	6.3	0.0005
42	bt	12.25	6.1	0.0005
43	at	12.27	6.2	0.0005
44	EWMA	12.84	4.4	0.0050
45	DEWMA	14.14	3.9	0.0500
46	Ft	15.96	3.6	0.5000
47	EWMA	17.57	4.7	0.0010
48	EWMA	20.96	9.9	0.0005
49	bt	23.70	49.5	0.3000
50	DEWMA	103.39	117.6	0.0100
51	bt	196.80	115.2	0.5000
52	DEWMA	201.76	112.0	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-22

	Chart	ARL1	SD	Lambda
1	EWMA	8.17	2.1	0.2000
2	DEWMA	8.24	2.1	0.5000
3	EWMA	8.27	2.2	0.3000
4	Ft	8.30	2.1	0.1000
5	at	8.31	2.0	0.1000
6	at	8.31	2.2	0.2000
7	Ft	8.36	2.2	0.2000
8	DEWMA	8.46	2.0	0.3000
9	bt	8.54	2.3	0.1000
10	at	8.63	2.4	0.3000
11	EWMA	8.64	2.1	0.1000
12	EWMA	8.68	2.4	0.5000
13	bt	8.75	2.1	0.0500
14	Ft	8.83	2.6	0.3000
15	Ft	8.84	2.1	0.0500
16	at	8.84	2.1	0.0500
17	DEWMA	9.23	2.1	0.2000
18	EWMA	9.31	2.3	0.0500
19	at	9.58	2.8	0.5000
20	bt	9.93	3.3	0.2000
21	bt	10.22	3.0	0.0100
22	at	10.50	3.3	0.0100
23	Ft	10.52	3.3	0.0100
24	Shewhart	10.97	3.2	0.0050
25	Shewhart	10.99	3.2	0.3000
26	Shewhart	11.00	3.2	0.0500
27	Shewhart	11.00	3.2	0.0005
28	bt	11.00	3.5	0.0050
29	Shewhart	11.01	3.2	0.5000
30	Shewhart	11.02	3.2	0.0010
31	Shewhart	11.03	3.2	0.0100
32	Shewhart	11.04	3.2	0.1000
33	Shewhart	11.05	3.2	0.2000
34	Ft	11.20	4.1	0.0050
35	DEWMA	11.23	2.7	0.1000
36	at	11.24	4.1	0.0050
37	EWMA	11.53	3.7	0.0100
38	bt	11.97	5.7	0.0010
39	Ft	11.99	6.0	0.0010
40	at	12.08	5.9	0.0010
41	bt	12.16	6.2	0.0005
42	Ft	12.17	6.3	0.0005
43	at	12.18	6.3	0.0005
44	EWMA	12.85	4.3	0.0050
45	DEWMA	14.19	4.0	0.0500
46	Ft	16.01	3.6	0.5000
47	EWMA	17.69	5.3	0.0010
48	EWMA	20.93	10.2	0.0005
49	bt	22.52	46.8	0.3000
50	DEWMA	103.15	117.6	0.0100
51	bt	198.46	114.4	0.5000
52	DEWMA	200.88	112.4	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-23

	Chart	ARL1	SD	Lambda
1	EWMA	7.94	2.0	0.2000
2	DEWMA	8.00	2.1	0.5000
3	Ft	8.03	2.0	0.1000
4	EWMA	8.03	2.0	0.3000
5	at	8.05	2.0	0.1000
6	at	8.06	2.1	0.2000
7	Ft	8.10	2.1	0.2000
8	bt	8.28	2.2	0.1000
9	DEWMA	8.30	1.9	0.3000
10	at	8.34	2.3	0.3000
11	EWMA	8.36	2.0	0.1000
12	EWMA	8.42	2.3	0.5000
13	bt	8.49	2.1	0.0500
14	Ft	8.53	2.4	0.3000
15	Ft	8.56	2.1	0.0500
16	at	8.57	2.1	0.0500
17	DEWMA	8.99	2.1	0.2000
18	EWMA	9.04	2.3	0.0500
19	at	9.28	2.7	0.5000
20	bt	9.49	3.1	0.2000
21	bt	9.96	2.9	0.0100
22	at	10.25	3.2	0.0100
23	Ft	10.26	3.2	0.0100
24	Shewhart	10.58	3.1	0.0100
25	Shewhart	10.60	3.0	0.0010
26	Shewhart	10.61	3.1	0.1000
27	Shewhart	10.63	3.1	0.0500
28	Shewhart	10.63	3.1	0.2000
29	Shewhart	10.63	3.1	0.5000
30	Shewhart	10.63	3.0	0.3000
31	Shewhart	10.64	3.1	0.0050
32	Shewhart	10.66	3.1	0.0005
33	bt	10.75	3.5	0.0050
34	Ft	10.93	4.0	0.0050
35	at	10.97	4.0	0.0050
36	DEWMA	11.00	2.7	0.1000
37	EWMA	11.24	3.6	0.0100
38	bt	11.63	5.6	0.0010
39	Ft	11.67	5.9	0.0010
40	at	11.73	5.9	0.0010
41	bt	11.87	6.0	0.0005
42	Ft	11.88	6.1	0.0005
43	at	11.89	6.1	0.0005
44	EWMA	12.53	4.2	0.0050
45	DEWMA	13.89	3.9	0.0500
46	Ft	15.22	3.4	0.5000
47	EWMA	17.16	4.7	0.0010
48	bt	18.89	38.3	0.3000
49	EWMA	20.16	5.9	0.0005
50	DEWMA	95.85	114.7	0.0100
51	bt	191.33	117.5	0.5000
52	DEWMA	197.00	114.3	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-23

	Chart	ARL1	SD	Lambda
1	EWMA	7.90	2.0	0.2000
2	EWMA	8.00	2.1	0.3000
3	at	8.02	2.1	0.2000
4	DEWMA	8.03	2.1	0.5000
5	Ft	8.05	2.2	0.2000
6	Ft	8.07	2.0	0.1000
7	at	8.07	2.0	0.1000
8	DEWMA	8.24	1.9	0.3000
9	bt	8.31	2.1	0.1000
10	at	8.32	2.3	0.3000
11	EWMA	8.38	2.0	0.1000
12	EWMA	8.44	2.3	0.5000
13	Ft	8.49	2.5	0.3000
14	bt	8.50	2.1	0.0500
15	Ft	8.57	2.1	0.0500
16	at	8.59	2.1	0.0500
17	DEWMA	8.99	2.0	0.2000
18	EWMA	9.04	2.3	0.0500
19	at	9.27	2.7	0.5000
20	bt	9.50	3.1	0.2000
21	bt	9.96	2.9	0.0100
22	at	10.25	3.1	0.0100
23	Ft	10.27	3.2	0.0100
24	Shewhart	10.56	3.1	0.0100
25	Shewhart	10.58	3.1	0.3000
26	Shewhart	10.60	3.1	0.1000
27	Shewhart	10.61	3.1	0.0005
28	Shewhart	10.62	3.1	0.0050
29	Shewhart	10.63	3.1	0.0500
30	Shewhart	10.64	3.1	0.2000
31	Shewhart	10.65	3.0	0.5000
32	Shewhart	10.66	3.0	0.0010
33	bt	10.68	3.5	0.0050
34	Ft	10.87	4.0	0.0050
35	at	10.91	4.0	0.0050
36	DEWMA	10.99	2.7	0.1000
37	EWMA	11.25	3.5	0.0100
38	bt	11.79	5.5	0.0010
39	Ft	11.82	5.8	0.0010
40	at	11.89	5.8	0.0010
41	bt	11.94	6.0	0.0005
42	Ft	11.94	6.2	0.0005
43	at	11.96	6.1	0.0005
44	EWMA	12.46	4.3	0.0050
45	DEWMA	13.89	3.9	0.0500
46	Ft	15.27	3.4	0.5000
47	EWMA	17.32	4.5	0.0010
48	bt	18.86	38.2	0.3000
49	EWMA	20.31	7.8	0.0005
50	DEWMA	93.81	113.7	0.0100
51	bt	191.63	117.5	0.5000
52	DEWMA	197.37	114.2	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-24

	Chart	ARL1	SD	Lambda
1	EWMA	7.69	1.9	0.2000
2	DEWMA	7.76	2.0	0.5000
3	at	7.79	2.0	0.2000
4	EWMA	7.80	2.0	0.3000
5	Ft	7.82	2.1	0.2000
6	Ft	7.85	1.9	0.1000
7	at	7.87	1.9	0.1000
8	DEWMA	8.07	1.9	0.3000
9	bt	8.08	2.1	0.1000
10	at	8.10	2.2	0.3000
11	EWMA	8.16	2.2	0.5000
12	EWMA	8.19	2.0	0.1000
13	bt	8.24	2.0	0.0500
14	Ft	8.28	2.4	0.3000
15	Ft	8.31	2.0	0.0500
16	at	8.33	2.0	0.0500
17	EWMA	8.79	2.2	0.0500
18	DEWMA	8.80	2.0	0.2000
19	at	8.94	2.6	0.5000
20	bt	9.13	2.9	0.2000
21	bt	9.77	2.8	0.0100
22	at	10.06	3.1	0.0100
23	Ft	10.07	3.1	0.0100
24	Shewhart	10.22	3.0	0.0005
25	Shewhart	10.22	2.9	0.0010
26	Shewhart	10.22	3.0	0.5000
27	Shewhart	10.25	3.0	0.0100
28	Shewhart	10.25	3.0	0.0500
29	Shewhart	10.27	3.0	0.0050
30	Shewhart	10.27	3.0	0.3000
31	Shewhart	10.28	2.9	0.1000
32	Shewhart	10.28	2.9	0.2000
33	bt	10.46	3.4	0.0050
34	Ft	10.67	3.9	0.0050
35	at	10.69	3.9	0.0050
36	DEWMA	10.80	2.6	0.1000
37	EWMA	11.04	3.5	0.0100
38	bt	11.22	5.5	0.0010
39	Ft	11.25	5.7	0.0010
40	at	11.32	5.7	0.0010
41	bt	11.69	5.9	0.0005
42	Ft	11.71	6.0	0.0005
43	at	11.73	6.0	0.0005
44	EWMA	12.24	4.1	0.0050
45	DEWMA	13.63	3.8	0.0500
46	Ft	14.66	3.3	0.5000
47	bt	15.65	28.2	0.3000
48	EWMA	16.67	4.5	0.0010
49	EWMA	19.81	6.4	0.0005
50	DEWMA	88.79	111.2	0.0100
51	bt	184.77	120.1	0.5000
52	DEWMA	193.75	115.7	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-24

	Chart	ARL1	SD	Lambda
1	EWMA	7.66	1.9	0.2000
2	DEWMA	7.75	2.0	0.5000
3	at	7.75	2.0	0.2000
4	Ft	7.78	2.1	0.2000
5	EWMA	7.82	2.0	0.3000
6	Ft	7.87	1.9	0.1000
7	at	7.88	1.9	0.1000
8	bt	8.07	2.1	0.1000
9	DEWMA	8.09	1.8	0.3000
10	at	8.14	2.2	0.3000
11	EWMA	8.16	2.3	0.5000
12	EWMA	8.19	2.0	0.1000
13	bt	8.25	2.0	0.0500
14	Ft	8.27	2.4	0.3000
15	Ft	8.31	2.0	0.0500
16	at	8.32	2.0	0.0500
17	EWMA	8.78	2.2	0.0500
18	DEWMA	8.79	2.0	0.2000
19	at	8.96	2.6	0.5000
20	bt	9.05	3.0	0.2000
21	bt	9.71	2.8	0.0100
22	at	9.99	3.1	0.0100
23	Ft	10.00	3.1	0.0100
24	Shewhart	10.18	3.0	0.2000
25	Shewhart	10.21	3.0	0.1000
26	Shewhart	10.23	3.0	0.0100
27	Shewhart	10.24	2.9	0.5000
28	Shewhart	10.24	3.0	0.0010
29	Shewhart	10.25	2.9	0.0005
30	Shewhart	10.27	2.9	0.0050
31	Shewhart	10.29	2.9	0.3000
32	Shewhart	10.30	2.9	0.0500
33	bt	10.46	3.4	0.0050
34	Ft	10.67	3.9	0.0050
35	at	10.70	3.8	0.0050
36	DEWMA	10.80	2.7	0.1000
37	EWMA	10.94	3.5	0.0100
38	bt	11.41	5.4	0.0010
39	Ft	11.43	5.7	0.0010
40	at	11.51	5.7	0.0010
41	bt	11.76	5.8	0.0005
42	Ft	11.78	5.9	0.0005
43	at	11.79	5.9	0.0005
44	EWMA	12.26	4.1	0.0050
45	DEWMA	13.56	3.9	0.0500
46	Ft	14.61	3.3	0.5000
47	bt	15.55	28.0	0.3000
48	EWMA	16.83	4.4	0.0010
49	EWMA	19.82	5.2	0.0005
50	DEWMA	87.04	110.5	0.0100
51	bt	182.69	120.9	0.5000
52	DEWMA	194.77	115.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-25

	Chart	ARL1	SD	Lambda
1	EWMA	7.49	1.9	0.2000
2	DEWMA	7.53	1.9	0.5000
3	at	7.54	2.0	0.2000
4	Ft	7.58	2.0	0.2000
5	EWMA	7.59	1.9	0.3000
6	Ft	7.69	1.9	0.1000
7	at	7.71	1.8	0.1000
8	bt	7.86	2.0	0.1000
9	at	7.88	2.2	0.3000
10	DEWMA	7.89	1.8	0.3000
11	EWMA	7.91	2.1	0.5000
12	Ft	8.03	2.3	0.3000
13	EWMA	8.03	1.9	0.1000
14	bt	8.10	1.9	0.0500
15	Ft	8.18	1.9	0.0500
16	at	8.19	1.9	0.0500
17	DEWMA	8.61	1.9	0.2000
18	EWMA	8.64	2.1	0.0500
19	at	8.66	2.5	0.5000
20	bt	8.75	2.7	0.2000
21	bt	9.52	2.8	0.0100
22	at	9.83	3.0	0.0100
23	Ft	9.85	3.0	0.0100
24	Shewhart	9.88	2.8	0.2000
25	Shewhart	9.89	2.9	0.5000
26	Shewhart	9.90	2.8	0.3000
27	Shewhart	9.91	2.9	0.0100
28	Shewhart	9.91	2.8	0.0005
29	Shewhart	9.91	2.8	0.0500
30	Shewhart	9.92	2.9	0.0050
31	Shewhart	9.94	2.8	0.0010
32	Shewhart	9.96	2.8	0.1000
33	bt	10.28	3.3	0.0050
34	Ft	10.49	3.8	0.0050
35	at	10.52	3.8	0.0050
36	DEWMA	10.66	2.5	0.1000
37	EWMA	10.80	3.4	0.0100
38	bt	11.11	5.3	0.0010
39	Ft	11.14	5.6	0.0010
40	at	11.21	5.5	0.0010
41	bt	11.39	5.8	0.0005
42	Ft	11.40	5.9	0.0005
43	at	11.42	5.9	0.0005
44	EWMA	12.04	4.0	0.0050
45	bt	13.22	19.3	0.3000
46	DEWMA	13.42	3.7	0.0500
47	Ft	14.08	3.2	0.5000
48	EWMA	16.39	4.4	0.0010
49	EWMA	19.22	3.9	0.0005
50	DEWMA	82.15	107.4	0.0100
51	bt	178.96	122.0	0.5000
52	DEWMA	191.16	116.6	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-25

	Chart	ARL1	SD	Lambda
1	EWMA	7.50	1.9	0.2000
2	DEWMA	7.54	1.9	0.5000
3	at	7.57	1.9	0.2000
4	EWMA	7.59	1.9	0.3000
5	Ft	7.59	2.0	0.2000
6	Ft	7.63	1.9	0.1000
7	at	7.65	1.8	0.1000
8	bt	7.81	2.0	0.1000
9	at	7.86	2.1	0.3000
10	DEWMA	7.86	1.8	0.3000
11	EWMA	7.90	2.2	0.5000
12	EWMA	7.97	1.9	0.1000
13	Ft	8.00	2.2	0.3000
14	bt	8.07	1.9	0.0500
15	Ft	8.16	2.0	0.0500
16	at	8.18	2.0	0.0500
17	DEWMA	8.62	1.9	0.2000
18	EWMA	8.65	2.2	0.0500
19	at	8.66	2.5	0.5000
20	bt	8.81	2.8	0.2000
21	bt	9.51	2.8	0.0100
22	at	9.79	3.0	0.0100
23	Ft	9.79	3.0	0.0100
24	Shewhart	9.85	2.8	0.3000
25	Shewhart	9.87	2.9	0.0010
26	Shewhart	9.88	2.9	0.0005
27	Shewhart	9.89	2.9	0.0500
28	Shewhart	9.90	2.8	0.2000
29	Shewhart	9.90	2.9	0.0050
30	Shewhart	9.91	2.8	0.0100
31	Shewhart	9.94	2.8	0.5000
32	Shewhart	9.95	2.9	0.1000
33	bt	10.24	3.3	0.0050
34	Ft	10.42	3.8	0.0050
35	at	10.45	3.8	0.0050
36	DEWMA	10.61	2.5	0.1000
37	EWMA	10.72	3.4	0.0100
38	bt	11.16	5.3	0.0010
39	Ft	11.18	5.6	0.0010
40	at	11.25	5.5	0.0010
41	bt	11.39	5.7	0.0005
42	Ft	11.40	5.9	0.0005
43	at	11.41	5.8	0.0005
44	EWMA	11.95	4.0	0.0050
45	bt	13.04	17.9	0.3000
46	DEWMA	13.45	3.7	0.0500
47	Ft	14.14	3.2	0.5000
48	EWMA	16.42	4.4	0.0010
49	EWMA	19.22	3.8	0.0005
50	DEWMA	79.72	106.2	0.0100
51	bt	181.06	121.2	0.5000
52	DEWMA	189.27	117.3	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-26

	Chart	ARL1	SD	Lambda
1	EWMA	7.27	1.8	0.2000
2	at	7.33	1.9	0.2000
3	EWMA	7.35	1.9	0.3000
4	Ft	7.36	2.0	0.2000
5	DEWMA	7.36	1.8	0.5000
6	Ft	7.48	1.8	0.1000
7	at	7.49	1.8	0.1000
8	at	7.60	2.1	0.3000
9	bt	7.61	1.9	0.1000
10	DEWMA	7.66	1.8	0.3000
11	EWMA	7.69	2.1	0.5000
12	Ft	7.74	2.2	0.3000
13	EWMA	7.81	1.9	0.1000
14	bt	7.84	1.9	0.0500
15	Ft	7.98	1.9	0.0500
16	at	7.98	1.9	0.0500
17	at	8.38	2.4	0.5000
18	DEWMA	8.39	1.9	0.2000
19	EWMA	8.47	2.1	0.0500
20	bt	8.48	2.6	0.2000
21	bt	9.28	2.7	0.0100
22	at	9.54	2.9	0.0100
23	Ft	9.55	3.0	0.0100
24	Shewhart	9.57	2.7	0.0010
25	Shewhart	9.58	2.8	0.2000
26	Shewhart	9.58	2.8	0.3000
27	Shewhart	9.59	2.8	0.5000
28	Shewhart	9.60	2.7	0.0100
29	Shewhart	9.61	2.8	0.0050
30	Shewhart	9.61	2.7	0.1000
31	Shewhart	9.62	2.7	0.0500
32	Shewhart	9.63	2.8	0.0005
33	bt	10.02	3.3	0.0050
34	Ft	10.19	3.8	0.0050
35	at	10.22	3.7	0.0050
36	DEWMA	10.43	2.5	0.1000
37	EWMA	10.49	3.3	0.0100
38	bt	10.88	5.3	0.0010
39	Ft	10.90	5.5	0.0010
40	at	10.97	5.5	0.0010
41	bt	11.13	5.6	0.0005
42	Ft	11.14	5.8	0.0005
43	at	11.15	5.7	0.0005
44	EWMA	11.69	4.0	0.0050
45	bt	11.82	12.3	0.3000
46	DEWMA	13.28	3.7	0.0500
47	Ft	13.57	3.0	0.5000
48	EWMA	16.09	4.3	0.0010
49	EWMA	18.81	3.8	0.0005
50	DEWMA	74.04	102.4	0.0100
51	bt	169.75	124.5	0.5000
52	DEWMA	183.59	119.3	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-26

	Chart	ARL1	SD	Lambda
1	EWMA	7.29	1.8	0.2000
2	DEWMA	7.35	1.8	0.5000
3	at	7.35	1.9	0.2000
4	Ft	7.38	1.9	0.2000
5	EWMA	7.38	1.9	0.3000
6	Ft	7.45	1.8	0.1000
7	at	7.47	1.8	0.1000
8	at	7.62	2.1	0.3000
9	bt	7.64	2.0	0.1000
10	EWMA	7.68	2.1	0.5000
11	DEWMA	7.68	1.8	0.3000
12	Ft	7.76	2.2	0.3000
13	EWMA	7.78	1.9	0.1000
14	bt	7.90	1.9	0.0500
15	Ft	7.98	1.9	0.0500
16	at	7.99	1.9	0.0500
17	at	8.40	2.4	0.5000
18	DEWMA	8.41	1.9	0.2000
19	EWMA	8.43	2.1	0.0500
20	bt	8.46	2.6	0.2000
21	bt	9.31	2.7	0.0100
22	Shewhart	9.54	2.8	0.0050
23	Shewhart	9.56	2.8	0.1000
24	Shewhart	9.59	2.8	0.5000
25	at	9.59	2.9	0.0100
26	Shewhart	9.60	2.8	0.0005
27	Ft	9.61	2.9	0.0100
28	Shewhart	9.61	2.7	0.2000
29	Shewhart	9.61	2.7	0.0500
30	Shewhart	9.61	2.8	0.3000
31	Shewhart	9.62	2.7	0.0010
32	Shewhart	9.62	2.8	0.0100
33	bt	10.03	3.3	0.0050
34	Ft	10.21	3.8	0.0050
35	at	10.25	3.7	0.0050
36	DEWMA	10.38	2.5	0.1000
37	EWMA	10.55	3.2	0.0100
38	bt	10.91	5.2	0.0010
39	Ft	10.93	5.5	0.0010
40	at	11.00	5.4	0.0010
41	bt	11.13	5.6	0.0005
42	Ft	11.14	5.7	0.0005
43	at	11.15	5.7	0.0005
44	EWMA	11.74	4.0	0.0050
45	bt	12.33	16.2	0.3000
46	DEWMA	13.21	3.7	0.0500
47	Ft	13.65	3.1	0.5000
48	EWMA	16.10	4.3	0.0010
49	EWMA	18.80	3.8	0.0005
50	DEWMA	74.51	102.7	0.0100
51	bt	172.08	123.8	0.5000
52	DEWMA	186.11	118.4	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-27

	Chart	ARL1	SD	Lambda
1	EWMA	7.10	1.8	0.2000
2	at	7.14	1.9	0.2000
3	Ft	7.16	1.9	0.2000
4	DEWMA	7.17	1.8	0.5000
5	EWMA	7.19	1.8	0.3000
6	Ft	7.29	1.8	0.1000
7	at	7.30	1.7	0.1000
8	bt	7.44	1.9	0.1000
9	at	7.44	2.0	0.3000
10	EWMA	7.45	2.0	0.5000
11	DEWMA	7.55	1.7	0.3000
12	Ft	7.57	2.1	0.3000
13	EWMA	7.62	1.8	0.1000
14	bt	7.71	1.9	0.0500
15	Ft	7.80	1.9	0.0500
16	at	7.80	1.9	0.0500
17	at	8.13	2.3	0.5000
18	bt	8.19	2.6	0.2000
19	DEWMA	8.24	1.9	0.2000
20	EWMA	8.25	2.1	0.0500
21	bt	9.13	2.6	0.0100
22	Shewhart	9.29	2.7	0.1000
23	Shewhart	9.29	2.6	0.0100
24	Shewhart	9.30	2.7	0.5000
25	Shewhart	9.30	2.7	0.0010
26	Shewhart	9.31	2.7	0.2000
27	Shewhart	9.31	2.7	0.0050
28	Shewhart	9.33	2.6	0.0005
29	Shewhart	9.35	2.6	0.3000
30	Shewhart	9.38	2.7	0.0500
31	at	9.40	2.9	0.0100
32	Ft	9.41	2.9	0.0100
33	bt	9.79	3.2	0.0050
34	Ft	9.98	3.6	0.0050
35	at	10.01	3.6	0.0050
36	DEWMA	10.24	2.4	0.1000
37	EWMA	10.30	3.3	0.0100
38	bt	10.67	5.1	0.0010
39	Ft	10.68	5.3	0.0010
40	at	10.76	5.3	0.0010
41	bt	10.89	5.5	0.0005
42	Ft	10.90	5.6	0.0005
43	at	10.92	5.6	0.0005
44	bt	11.10	9.0	0.3000
45	EWMA	11.45	3.9	0.0050
46	DEWMA	12.96	3.6	0.0500
47	Ft	13.14	3.0	0.5000
48	EWMA	15.75	4.2	0.0010
49	EWMA	18.41	3.7	0.0005
50	DEWMA	67.83	97.8	0.0100
51	bt	165.59	125.2	0.5000
52	DEWMA	182.77	119.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-27

	Chart	ARL1	SD	Lambda
1	EWMA	7.14	1.8	0.2000
2	DEWMA	7.15	1.8	0.5000
3	EWMA	7.18	1.8	0.3000
4	at	7.18	1.8	0.2000
5	Ft	7.20	1.9	0.2000
6	Ft	7.28	1.8	0.1000
7	at	7.29	1.7	0.1000
8	at	7.42	2.0	0.3000
9	EWMA	7.43	2.0	0.5000
10	bt	7.44	1.9	0.1000
11	DEWMA	7.53	1.7	0.3000
12	Ft	7.54	2.1	0.3000
13	EWMA	7.61	1.8	0.1000
14	bt	7.69	1.9	0.0500
15	Ft	7.76	1.9	0.0500
16	at	7.78	1.9	0.0500
17	at	8.10	2.3	0.5000
18	bt	8.16	2.5	0.2000
19	EWMA	8.21	2.1	0.0500
20	DEWMA	8.29	1.8	0.2000
21	bt	9.12	2.6	0.0100
22	Shewhart	9.27	2.6	0.5000
23	Shewhart	9.28	2.6	0.2000
24	Shewhart	9.29	2.7	0.0500
25	Shewhart	9.29	2.7	0.0100
26	Shewhart	9.31	2.6	0.0010
27	Shewhart	9.31	2.7	0.1000
28	Shewhart	9.33	2.7	0.0005
29	Shewhart	9.34	2.6	0.0050
30	Shewhart	9.34	2.6	0.3000
31	at	9.39	2.9	0.0100
32	Ft	9.41	2.9	0.0100
33	bt	9.78	3.2	0.0050
34	Ft	9.97	3.7	0.0050
35	at	10.00	3.7	0.0050
36	DEWMA	10.22	2.5	0.1000
37	EWMA	10.32	3.2	0.0100
38	bt	10.70	5.0	0.0010
39	Ft	10.72	5.3	0.0010
40	at	10.80	5.2	0.0010
41	bt	10.94	5.5	0.0005
42	Ft	10.95	5.6	0.0005
43	at	10.97	5.6	0.0005
44	bt	11.25	10.7	0.3000
45	EWMA	11.44	3.9	0.0050
46	DEWMA	12.89	3.7	0.0500
47	Ft	13.07	2.9	0.5000
48	EWMA	15.77	4.1	0.0010
49	EWMA	18.47	3.7	0.0005
50	DEWMA	68.48	98.4	0.0100
51	bt	164.07	125.4	0.5000
52	DEWMA	182.14	119.7	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-28

	Chart	ARL1	SD	Lambda
1	EWMA	6.97	1.7	0.2000
2	at	6.98	1.8	0.2000
3	DEWMA	6.99	1.7	0.5000
4	Ft	7.00	1.8	0.2000
5	EWMA	7.03	1.8	0.3000
6	Ft	7.11	1.7	0.1000
7	at	7.12	1.7	0.1000
8	at	7.22	2.0	0.3000
9	bt	7.24	1.8	0.1000
10	EWMA	7.25	1.9	0.5000
11	Ft	7.34	2.1	0.3000
12	DEWMA	7.38	1.7	0.3000
13	EWMA	7.45	1.8	0.1000
14	bt	7.48	1.8	0.0500
15	at	7.60	1.9	0.0500
16	Ft	7.60	1.9	0.0500
17	at	7.89	2.2	0.5000
18	bt	7.94	2.4	0.2000
19	EWMA	8.04	2.0	0.0500
20	DEWMA	8.11	1.8	0.2000
21	bt	8.97	2.6	0.0100
22	Shewhart	9.00	2.6	0.5000
23	Shewhart	9.00	2.6	0.2000
24	Shewhart	9.02	2.6	0.1000
25	Shewhart	9.02	2.6	0.0100
26	Shewhart	9.02	2.6	0.0005
27	Shewhart	9.05	2.6	0.0010
28	Shewhart	9.06	2.6	0.0500
29	Shewhart	9.06	2.6	0.3000
30	Shewhart	9.06	2.5	0.0050
31	at	9.23	2.8	0.0100
32	Ft	9.25	2.8	0.0100
33	bt	9.61	3.1	0.0050
34	Ft	9.78	3.6	0.0050
35	at	9.82	3.6	0.0050
36	DEWMA	10.06	2.5	0.1000
37	EWMA	10.12	3.2	0.0100
38	bt	10.45	6.7	0.3000
39	bt	10.55	5.0	0.0010
40	Ft	10.59	5.2	0.0010
41	bt	10.60	5.4	0.0005
42	Ft	10.61	5.5	0.0005
43	at	10.61	5.5	0.0005
44	at	10.65	5.2	0.0010
45	EWMA	11.24	3.8	0.0050
46	Ft	12.62	2.9	0.5000
47	DEWMA	12.73	3.6	0.0500
48	EWMA	15.53	4.0	0.0010
49	EWMA	18.03	3.6	0.0005
50	DEWMA	62.23	93.2	0.0100
51	bt	157.81	126.4	0.5000
52	DEWMA	177.71	120.9	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-28

	Chart	ARL1	SD	Lambda
1	DEWMA	6.96	1.8	0.5000
2	EWMA	6.99	1.7	0.2000
3	at	7.00	1.8	0.2000
4	EWMA	7.02	1.7	0.3000
5	Ft	7.02	1.8	0.2000
6	Ft	7.13	1.7	0.1000
7	at	7.14	1.7	0.1000
8	at	7.21	1.9	0.3000
9	EWMA	7.23	2.0	0.5000
10	bt	7.26	1.8	0.1000
11	Ft	7.33	2.1	0.3000
12	DEWMA	7.38	1.6	0.3000
13	EWMA	7.46	1.8	0.1000
14	bt	7.53	1.8	0.0500
15	Ft	7.60	1.9	0.0500
16	at	7.62	1.9	0.0500
17	at	7.88	2.2	0.5000
18	bt	7.96	2.4	0.2000
19	EWMA	8.06	2.1	0.0500
20	DEWMA	8.13	1.8	0.2000
21	bt	8.94	2.6	0.0100
22	Shewhart	9.00	2.6	0.3000
23	Shewhart	9.02	2.6	0.5000
24	Shewhart	9.03	2.6	0.0050
25	Shewhart	9.03	2.6	0.0005
26	Shewhart	9.04	2.6	0.0010
27	Shewhart	9.07	2.6	0.0500
28	Shewhart	9.08	2.6	0.2000
29	Shewhart	9.08	2.6	0.0100
30	Shewhart	9.08	2.6	0.1000
31	at	9.22	2.8	0.0100
32	Ft	9.23	2.8	0.0100
33	bt	9.61	3.2	0.0050
34	Ft	9.81	3.6	0.0050
35	at	9.84	3.6	0.0050
36	DEWMA	10.08	2.5	0.1000
37	EWMA	10.13	3.2	0.0100
38	bt	10.32	5.6	0.3000
39	bt	10.48	4.9	0.0010
40	Ft	10.50	5.2	0.0010
41	at	10.57	5.1	0.0010
42	bt	10.75	5.3	0.0005
43	Ft	10.76	5.5	0.0005
44	at	10.77	5.5	0.0005
45	EWMA	11.26	3.8	0.0050
46	Ft	12.67	2.9	0.5000
47	DEWMA	12.77	3.6	0.0500
48	EWMA	15.46	4.0	0.0010
49	EWMA	18.10	3.6	0.0005
50	DEWMA	61.90	92.8	0.0100
51	bt	158.50	126.3	0.5000
52	DEWMA	179.20	120.4	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-29

	Chart	ARL1	SD	Lambda
1	EWMA	6.77	1.7	0.2000
2	at	6.79	1.7	0.2000
3	Ft	6.80	1.8	0.2000
4	DEWMA	6.81	1.7	0.5000
5	EWMA	6.84	1.7	0.3000
6	Ft	6.95	1.7	0.1000
7	at	6.98	1.7	0.1000
8	at	7.04	1.9	0.3000
9	EWMA	7.04	1.9	0.5000
10	bt	7.05	1.8	0.1000
11	Ft	7.14	2.0	0.3000
12	DEWMA	7.21	1.6	0.3000
13	EWMA	7.32	1.7	0.1000
14	bt	7.34	1.8	0.0500
15	Ft	7.46	1.8	0.0500
16	at	7.47	1.8	0.0500
17	at	7.66	2.2	0.5000
18	bt	7.67	2.3	0.2000
19	EWMA	7.93	2.0	0.0500
20	DEWMA	7.95	1.8	0.2000
21	Shewhart	8.73	2.5	0.3000
22	Shewhart	8.74	2.5	0.5000
23	Shewhart	8.76	2.5	0.2000
24	Shewhart	8.76	2.5	0.1000
25	Shewhart	8.76	2.5	0.0010
26	Shewhart	8.78	2.5	0.0050
27	bt	8.79	2.5	0.0100
28	Shewhart	8.80	2.5	0.0100
29	Shewhart	8.81	2.5	0.0005
30	Shewhart	8.81	2.5	0.0500
31	at	9.06	2.7	0.0100
32	Ft	9.09	2.8	0.0100
33	bt	9.47	3.0	0.0050
34	Ft	9.66	3.5	0.0050
35	at	9.70	3.4	0.0050
36	EWMA	9.95	3.1	0.0100
37	DEWMA	9.96	2.4	0.1000
38	bt	9.96	6.5	0.3000
39	bt	10.26	4.9	0.0010
40	Ft	10.30	5.2	0.0010
41	at	10.35	5.1	0.0010
42	bt	10.44	5.3	0.0005
43	Ft	10.44	5.4	0.0005
44	at	10.46	5.4	0.0005
45	EWMA	11.08	3.7	0.0050
46	Ft	12.21	2.8	0.5000
47	DEWMA	12.65	3.5	0.0500
48	EWMA	15.15	4.1	0.0010
49	EWMA	17.69	3.6	0.0005
50	DEWMA	58.76	89.9	0.0100
51	bt	149.07	127.3	0.5000
52	DEWMA	173.69	121.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-29

	Chart	ARL1	SD	Lambda
1	EWMA	6.77	1.7	0.2000
2	at	6.80	1.7	0.2000
3	Ft	6.83	1.8	0.2000
4	DEWMA	6.83	1.7	0.5000
5	EWMA	6.85	1.7	0.3000
6	Ft	6.95	1.7	0.1000
7	at	6.97	1.7	0.1000
8	at	7.04	1.9	0.3000
9	EWMA	7.08	1.9	0.5000
10	bt	7.09	1.8	0.1000
11	Ft	7.15	2.0	0.3000
12	DEWMA	7.21	1.7	0.3000
13	EWMA	7.28	1.8	0.1000
14	bt	7.34	1.8	0.0500
15	Ft	7.47	1.8	0.0500
16	at	7.48	1.8	0.0500
17	bt	7.70	2.3	0.2000
18	at	7.71	2.2	0.5000
19	DEWMA	7.92	1.8	0.2000
20	EWMA	7.93	2.0	0.0500
21	bt	8.68	2.6	0.0100
22	Shewhart	8.75	2.5	0.0500
23	Shewhart	8.76	2.5	0.0100
24	Shewhart	8.76	2.5	0.3000
25	Shewhart	8.78	2.5	0.0005
26	Shewhart	8.78	2.5	0.2000
27	Shewhart	8.80	2.5	0.1000
28	Shewhart	8.83	2.5	0.0050
29	Shewhart	8.83	2.5	0.5000
30	Shewhart	8.83	2.5	0.0010
31	at	8.94	2.8	0.0100
32	Ft	8.96	2.8	0.0100
33	bt	9.49	3.0	0.0050
34	Ft	9.67	3.5	0.0050
35	at	9.70	3.5	0.0050
36	EWMA	9.84	3.1	0.0100
37	DEWMA	9.88	2.4	0.1000
38	bt	9.92	5.5	0.3000
39	bt	10.33	4.9	0.0010
40	Ft	10.35	5.1	0.0010
41	at	10.42	5.1	0.0010
42	bt	10.43	5.4	0.0005
43	Ft	10.44	5.5	0.0005
44	at	10.45	5.5	0.0005
45	EWMA	11.07	3.7	0.0050
46	Ft	12.26	2.8	0.5000
47	DEWMA	12.65	3.5	0.0500
48	EWMA	15.22	3.9	0.0010
49	EWMA	17.70	3.6	0.0005
50	DEWMA	56.67	87.9	0.0100
51	bt	149.30	127.1	0.5000
52	DEWMA	174.47	121.7	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-30

	Chart	ARL1	SD	Lambda
1	EWMA	6.67	1.7	0.3000
2	DEWMA	6.69	1.6	0.5000
3	at	6.69	1.7	0.2000
4	EWMA	6.69	1.6	0.2000
5	Ft	6.71	1.7	0.2000
6	Ft	6.83	1.6	0.1000
7	at	6.84	1.6	0.1000
8	at	6.85	1.8	0.3000
9	EWMA	6.92	1.8	0.5000
10	bt	6.94	1.7	0.1000
11	Ft	6.95	1.9	0.3000
12	DEWMA	7.06	1.6	0.3000
13	EWMA	7.14	1.7	0.1000
14	bt	7.20	1.8	0.0500
15	Ft	7.32	1.8	0.0500
16	at	7.32	1.7	0.0500
17	at	7.50	2.1	0.5000
18	bt	7.51	2.2	0.2000
19	EWMA	7.76	1.9	0.0500
20	DEWMA	7.87	1.7	0.2000
21	Shewhart	8.52	2.5	0.3000
22	Shewhart	8.53	2.5	0.0005
23	Shewhart	8.53	2.4	0.0100
24	Shewhart	8.53	2.5	0.0500
25	Shewhart	8.53	2.4	0.5000
26	Shewhart	8.54	2.4	0.1000
27	Shewhart	8.55	2.4	0.0010
28	Shewhart	8.57	2.4	0.0050
29	Shewhart	8.61	2.4	0.2000
30	bt	8.63	2.5	0.0100
31	at	8.90	2.7	0.0100
32	Ft	8.92	2.7	0.0100
33	bt	9.32	3.0	0.0050
34	bt	9.48	3.8	0.3000
35	Ft	9.50	3.4	0.0050
36	at	9.53	3.4	0.0050
37	DEWMA	9.73	2.3	0.1000
38	EWMA	9.77	3.1	0.0100
39	bt	10.09	4.8	0.0010
40	Ft	10.13	5.0	0.0010
41	at	10.18	5.0	0.0010
42	bt	10.26	5.2	0.0005
43	Ft	10.26	5.3	0.0005
44	at	10.28	5.3	0.0005
45	EWMA	10.90	3.6	0.0050
46	Ft	11.87	2.7	0.5000
47	DEWMA	12.39	3.5	0.0500
48	EWMA	14.87	4.0	0.0010
49	EWMA	17.39	3.5	0.0005
50	DEWMA	53.97	85.1	0.0100
51	bt	139.95	127.4	0.5000
52	DEWMA	171.51	122.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-30

	Chart	ARL1	SD	Lambda
1	EWMA	6.68	1.6	0.2000
2	DEWMA	6.68	1.6	0.5000
3	at	6.68	1.7	0.2000
4	EWMA	6.69	1.7	0.3000
5	Ft	6.70	1.7	0.2000
6	Ft	6.83	1.6	0.1000
7	at	6.85	1.8	0.3000
8	at	6.86	1.6	0.1000
9	EWMA	6.92	1.8	0.5000
10	Ft	6.93	1.9	0.3000
11	bt	6.94	1.7	0.1000
12	DEWMA	7.08	1.6	0.3000
13	EWMA	7.18	1.7	0.1000
14	bt	7.22	1.7	0.0500
15	Ft	7.32	1.8	0.0500
16	at	7.33	1.7	0.0500
17	bt	7.48	2.2	0.2000
18	at	7.54	2.1	0.5000
19	EWMA	7.78	1.9	0.0500
20	DEWMA	7.83	1.8	0.2000
21	Shewhart	8.50	2.4	0.0005
22	Shewhart	8.52	2.4	0.3000
23	Shewhart	8.53	2.4	0.2000
24	Shewhart	8.54	2.4	0.0010
25	Shewhart	8.56	2.4	0.0100
26	Shewhart	8.57	2.4	0.0050
27	Shewhart	8.57	2.4	0.5000
28	Shewhart	8.57	2.4	0.0500
29	bt	8.58	2.5	0.0100
30	Shewhart	8.59	2.4	0.1000
31	at	8.84	2.7	0.0100
32	Ft	8.85	2.7	0.0100
33	bt	9.30	3.0	0.0050
34	bt	9.44	3.7	0.3000
35	Ft	9.49	3.5	0.0050
36	at	9.52	3.4	0.0050
37	EWMA	9.69	3.0	0.0100
38	DEWMA	9.82	2.2	0.1000
39	bt	10.08	4.8	0.0010
40	Ft	10.11	5.1	0.0010
41	at	10.17	5.0	0.0010
42	bt	10.24	5.2	0.0005
43	Ft	10.25	5.3	0.0005
44	at	10.27	5.3	0.0005
45	EWMA	10.88	3.7	0.0050
46	Ft	11.87	2.7	0.5000
47	DEWMA	12.44	3.4	0.0500
48	EWMA	14.88	4.0	0.0010
49	EWMA	17.37	3.5	0.0005
50	DEWMA	50.75	81.7	0.0100
51	bt	141.32	127.4	0.5000
52	DEWMA	172.34	122.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-31

	Chart	ARL1	SD	Lambda
1	at	6.51	1.6	0.2000
2	EWMA	6.53	1.6	0.2000
3	Ft	6.53	1.7	0.2000
4	DEWMA	6.54	1.6	0.5000
5	EWMA	6.54	1.6	0.3000
6	at	6.69	1.8	0.3000
7	Ft	6.70	1.6	0.1000
8	at	6.71	1.6	0.1000
9	EWMA	6.76	1.8	0.5000
10	Ft	6.78	1.9	0.3000
11	bt	6.78	1.7	0.1000
12	DEWMA	6.95	1.6	0.3000
13	EWMA	7.04	1.6	0.1000
14	bt	7.10	1.7	0.0500
15	Ft	7.21	1.7	0.0500
16	at	7.21	1.7	0.0500
17	bt	7.27	2.2	0.2000
18	at	7.31	2.0	0.5000
19	EWMA	7.64	1.9	0.0500
20	DEWMA	7.70	1.7	0.2000
21	Shewhart	8.25	2.4	0.0050
22	Shewhart	8.30	2.4	0.0100
23	Shewhart	8.32	2.3	0.0005
24	Shewhart	8.32	2.4	0.3000
25	Shewhart	8.33	2.3	0.5000
26	Shewhart	8.35	2.4	0.0500
27	Shewhart	8.35	2.3	0.1000
28	Shewhart	8.38	2.4	0.2000
29	Shewhart	8.38	2.4	0.0010
30	bt	8.46	2.4	0.0100
31	at	8.72	2.6	0.0100
32	Ft	8.73	2.7	0.0100
33	bt	9.08	2.9	0.0050
34	bt	9.12	3.6	0.3000
35	Ft	9.27	3.4	0.0050
36	at	9.30	3.4	0.0050
37	EWMA	9.56	3.0	0.0100
38	DEWMA	9.62	2.3	0.1000
39	bt	9.95	4.6	0.0010
40	Ft	9.97	4.9	0.0010
41	at	10.03	4.8	0.0010
42	bt	10.05	5.1	0.0005
43	Ft	10.06	5.2	0.0005
44	at	10.07	5.2	0.0005
45	EWMA	10.64	3.6	0.0050
46	Ft	11.52	2.6	0.5000
47	DEWMA	12.30	3.4	0.0500
48	EWMA	14.66	3.8	0.0010
49	EWMA	17.05	3.5	0.0005
50	DEWMA	46.81	76.6	0.0100
51	bt	132.59	127.0	0.5000
52	DEWMA	168.45	122.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-31

	Chart	ARL1	SD	Lambda
1	at	6.50	1.6	0.2000
2	Ft	6.50	1.7	0.2000
3	EWMA	6.51	1.6	0.2000
4	EWMA	6.53	1.6	0.3000
5	DEWMA	6.54	1.6	0.5000
6	at	6.68	1.8	0.3000
7	Ft	6.69	1.6	0.1000
8	at	6.70	1.6	0.1000
9	EWMA	6.75	1.8	0.5000
10	Ft	6.78	1.9	0.3000
11	bt	6.80	1.7	0.1000
12	DEWMA	6.94	1.6	0.3000
13	EWMA	7.02	1.7	0.1000
14	bt	7.10	1.7	0.0500
15	Ft	7.19	1.7	0.0500
16	at	7.19	1.7	0.0500
17	bt	7.25	2.1	0.2000
18	at	7.30	2.1	0.5000
19	EWMA	7.62	1.9	0.0500
20	DEWMA	7.70	1.7	0.2000
21	Shewhart	8.31	2.4	0.0500
22	Shewhart	8.31	2.3	0.2000
23	Shewhart	8.32	2.3	0.3000
24	Shewhart	8.32	2.4	0.0005
25	Shewhart	8.34	2.4	0.5000
26	Shewhart	8.34	2.4	0.0050
27	Shewhart	8.34	2.4	0.0100
28	Shewhart	8.35	2.4	0.1000
29	Shewhart	8.36	2.4	0.0010
30	bt	8.46	2.4	0.0100
31	at	8.72	2.7	0.0100
32	Ft	8.74	2.7	0.0100
33	bt	9.06	2.9	0.0050
34	bt	9.12	3.5	0.3000
35	Ft	9.22	3.4	0.0050
36	at	9.25	3.4	0.0050
37	EWMA	9.59	3.0	0.0100
38	DEWMA	9.60	2.3	0.1000
39	bt	10.02	4.7	0.0010
40	Ft	10.05	4.9	0.0010
41	at	10.11	4.9	0.0010
42	bt	10.22	5.1	0.0005
43	Ft	10.23	5.2	0.0005
44	at	10.24	5.2	0.0005
45	EWMA	10.60	3.6	0.0050
46	Ft	11.51	2.6	0.5000
47	DEWMA	12.23	3.4	0.0500
48	EWMA	14.72	3.8	0.0010
49	EWMA	17.19	3.4	0.0005
50	DEWMA	49.21	79.8	0.0100
51	bt	131.86	127.0	0.5000
52	DEWMA	165.49	123.4	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-32

	Chart	ARL1	SD	Lambda
1	at	6.37	1.6	0.2000
2	Ft	6.38	1.7	0.2000
3	EWMA	6.38	1.6	0.2000
4	DEWMA	6.39	1.5	0.5000
5	EWMA	6.43	1.6	0.3000
6	at	6.55	1.7	0.3000
7	Ft	6.58	1.6	0.1000
8	at	6.59	1.6	0.1000
9	EWMA	6.60	1.7	0.5000
10	Ft	6.63	1.8	0.3000
11	bt	6.67	1.6	0.1000
12	DEWMA	6.84	1.5	0.3000
13	EWMA	6.90	1.6	0.1000
14	bt	6.93	1.6	0.0500
15	Ft	7.07	1.7	0.0500
16	at	7.07	1.6	0.0500
17	bt	7.10	2.1	0.2000
18	at	7.13	2.0	0.5000
19	EWMA	7.50	1.8	0.0500
20	DEWMA	7.57	1.7	0.2000
21	Shewhart	8.09	2.3	0.0100
22	Shewhart	8.10	2.3	0.2000
23	Shewhart	8.10	2.3	0.0005
24	Shewhart	8.11	2.3	0.0010
25	Shewhart	8.11	2.3	0.0500
26	Shewhart	8.12	2.3	0.5000
27	Shewhart	8.12	2.3	0.3000
28	Shewhart	8.12	2.3	0.1000
29	Shewhart	8.14	2.3	0.0050
30	bt	8.27	2.4	0.0100
31	at	8.50	2.6	0.0100
32	Ft	8.51	2.6	0.0100
33	bt	8.73	3.3	0.3000
34	bt	8.95	2.9	0.0050
35	Ft	9.11	3.4	0.0050
36	at	9.15	3.3	0.0050
37	EWMA	9.32	3.0	0.0100
38	DEWMA	9.48	2.3	0.1000
39	bt	9.74	4.6	0.0010
40	Ft	9.76	4.8	0.0010
41	at	9.81	4.8	0.0010
42	bt	9.98	5.0	0.0005
43	Ft	9.99	5.1	0.0005
44	at	10.01	5.1	0.0005
45	EWMA	10.46	3.5	0.0050
46	Ft	11.15	2.5	0.5000
47	DEWMA	12.11	3.4	0.0500
48	EWMA	14.38	3.8	0.0010
49	EWMA	16.83	3.4	0.0005
50	DEWMA	43.26	72.4	0.0100
51	bt	125.80	126.4	0.5000
52	DEWMA	160.23	123.9	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-32

	Chart	ARL1	SD	Lambda
1	at	6.36	1.6	0.2000
2	EWMA	6.37	1.6	0.2000
3	Ft	6.37	1.6	0.2000
4	DEWMA	6.39	1.6	0.5000
5	EWMA	6.41	1.6	0.3000
6	at	6.54	1.7	0.3000
7	Ft	6.56	1.6	0.1000
8	at	6.57	1.6	0.1000
9	EWMA	6.59	1.7	0.5000
10	Ft	6.62	1.8	0.3000
11	bt	6.63	1.7	0.1000
12	DEWMA	6.83	1.5	0.3000
13	EWMA	6.88	1.6	0.1000
14	bt	6.93	1.6	0.0500
15	Ft	7.03	1.7	0.0500
16	at	7.04	1.7	0.0500
17	bt	7.08	2.1	0.2000
18	at	7.10	2.0	0.5000
19	EWMA	7.46	1.9	0.0500
20	DEWMA	7.56	1.7	0.2000
21	Shewhart	8.07	2.3	0.0500
22	Shewhart	8.09	2.3	0.2000
23	Shewhart	8.09	2.3	0.0050
24	Shewhart	8.10	2.3	0.5000
25	Shewhart	8.10	2.3	0.3000
26	Shewhart	8.10	2.3	0.0100
27	Shewhart	8.12	2.3	0.0005
28	Shewhart	8.14	2.3	0.1000
29	Shewhart	8.14	2.3	0.0010
30	bt	8.29	2.4	0.0100
31	at	8.58	2.5	0.0100
32	Ft	8.59	2.6	0.0100
33	bt	8.74	3.3	0.3000
34	bt	8.98	2.8	0.0050
35	Ft	9.13	3.3	0.0050
36	at	9.17	3.3	0.0050
37	EWMA	9.44	2.9	0.0100
38	DEWMA	9.47	2.3	0.1000
39	bt	9.73	4.7	0.0010
40	Ft	9.75	4.9	0.0010
41	at	9.81	4.9	0.0010
42	bt	10.00	5.0	0.0005
43	Ft	10.01	5.2	0.0005
44	at	10.02	5.1	0.0005
45	EWMA	10.48	3.5	0.0050
46	Ft	11.18	2.5	0.5000
47	DEWMA	12.07	3.4	0.0500
48	EWMA	14.38	3.8	0.0010
49	EWMA	16.86	3.4	0.0005
50	DEWMA	43.19	71.7	0.0100
51	bt	125.55	126.4	0.5000
52	DEWMA	161.12	123.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-33

	Chart	ARL1	SD	Lambda
1	at	5.80	1.4	0.2000
2	Ft	5.80	1.5	0.2000
3	EWMA	5.82	1.4	0.3000
4	DEWMA	5.83	1.4	0.5000
5	EWMA	5.85	1.4	0.2000
6	at	5.89	1.5	0.3000
7	Ft	5.95	1.6	0.3000
8	EWMA	5.96	1.5	0.5000
9	Ft	6.01	1.4	0.1000
10	at	6.02	1.4	0.1000
11	bt	6.05	1.5	0.1000
12	DEWMA	6.29	1.4	0.3000
13	bt	6.31	1.8	0.2000
14	EWMA	6.34	1.5	0.1000
15	at	6.37	1.8	0.5000
16	bt	6.39	1.5	0.0500
17	Ft	6.51	1.6	0.0500
18	at	6.52	1.5	0.0500
19	EWMA	6.93	1.7	0.0500
20	DEWMA	7.06	1.5	0.2000
21	Shewhart	7.21	2.1	0.1000
22	Shewhart	7.22	2.0	0.0050
23	Shewhart	7.22	2.0	0.0005
24	Shewhart	7.22	2.0	0.0100
25	Shewhart	7.22	2.0	0.2000
26	Shewhart	7.23	2.0	0.5000
27	Shewhart	7.24	2.0	0.3000
28	Shewhart	7.26	2.0	0.0010
29	Shewhart	7.26	2.0	0.0500
30	bt	7.47	2.6	0.3000
31	bt	7.69	2.2	0.0100
32	at	7.94	2.4	0.0100
33	Ft	7.95	2.4	0.0100
34	bt	8.32	2.6	0.0050
35	Ft	8.48	3.1	0.0050
36	at	8.50	3.0	0.0050
37	EWMA	8.72	2.7	0.0100
38	DEWMA	8.89	2.1	0.1000
39	bt	8.95	4.3	0.0010
40	Ft	8.97	4.5	0.0010
41	at	9.03	4.5	0.0010
42	bt	9.30	4.6	0.0005
43	Ft	9.32	4.7	0.0005
44	at	9.32	4.7	0.0005
45	EWMA	9.71	3.3	0.0050
46	Ft	9.73	2.2	0.5000
47	DEWMA	11.47	3.1	0.0500
48	EWMA	13.27	3.5	0.0010
49	EWMA	15.62	3.1	0.0005
50	DEWMA	29.87	48.8	0.0100
51	bt	82.27	113.0	0.5000
52	DEWMA	140.58	124.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-33

	Chart	ARL1	SD	Lambda
1	DEWMA	5.80	1.4	0.5000
2	at	5.81	1.4	0.2000
3	EWMA	5.82	1.4	0.3000
4	Ft	5.82	1.5	0.2000
5	EWMA	5.86	1.4	0.2000
6	at	5.89	1.5	0.3000
7	EWMA	5.92	1.5	0.5000
8	Ft	5.96	1.6	0.3000
9	Ft	5.99	1.4	0.1000
10	at	6.00	1.4	0.1000
11	bt	6.06	1.5	0.1000
12	DEWMA	6.30	1.4	0.3000
13	EWMA	6.31	1.5	0.1000
14	at	6.32	1.8	0.5000
15	bt	6.32	1.8	0.2000
16	bt	6.35	1.5	0.0500
17	Ft	6.49	1.5	0.0500
18	at	6.50	1.5	0.0500
19	EWMA	6.90	1.7	0.0500
20	DEWMA	7.07	1.5	0.2000
21	Shewhart	7.19	2.0	0.5000
22	Shewhart	7.20	2.0	0.0500
23	Shewhart	7.21	2.0	0.0100
24	Shewhart	7.22	2.0	0.2000
25	Shewhart	7.23	2.0	0.0050
26	Shewhart	7.24	2.0	0.1000
27	Shewhart	7.24	2.0	0.3000
28	Shewhart	7.24	2.0	0.0010
29	Shewhart	7.26	2.0	0.0005
30	bt	7.50	2.7	0.3000
31	bt	7.69	2.2	0.0100
32	at	7.95	2.4	0.0100
33	Ft	7.96	2.4	0.0100
34	bt	8.26	2.7	0.0050
35	Ft	8.43	3.1	0.0050
36	at	8.46	3.1	0.0050
37	EWMA	8.73	2.7	0.0100
38	DEWMA	8.83	2.1	0.1000
39	bt	9.05	4.3	0.0010
40	Ft	9.07	4.5	0.0010
41	at	9.13	4.5	0.0010
42	Ft	9.26	4.8	0.0005
43	bt	9.26	4.6	0.0005
44	at	9.28	4.7	0.0005
45	EWMA	9.67	3.3	0.0050
46	Ft	9.77	2.2	0.5000
47	DEWMA	11.41	3.1	0.0500
48	EWMA	13.34	3.5	0.0010
49	EWMA	15.61	3.1	0.0005
50	DEWMA	30.22	49.8	0.0100
51	bt	87.02	115.5	0.5000
52	DEWMA	141.16	124.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-34

	Chart	ARL1	SD	Lambda
1	Ft	5.33	1.3	0.2000
2	at	5.34	1.3	0.2000
3	EWMA	5.34	1.3	0.3000
4	at	5.37	1.4	0.3000
5	DEWMA	5.37	1.3	0.5000
6	Ft	5.40	1.4	0.3000
7	EWMA	5.41	1.3	0.2000
8	EWMA	5.45	1.4	0.5000
9	Ft	5.56	1.3	0.1000
10	bt	5.57	1.3	0.1000
11	at	5.57	1.3	0.1000
12	bt	5.71	1.6	0.2000
13	at	5.77	1.6	0.5000
14	DEWMA	5.88	1.3	0.3000
15	EWMA	5.88	1.4	0.1000
16	bt	5.90	1.4	0.0500
17	Ft	6.03	1.4	0.0500
18	at	6.04	1.4	0.0500
19	EWMA	6.44	1.6	0.0500
20	Shewhart	6.51	1.8	0.2000
21	Shewhart	6.51	1.8	0.0050
22	Shewhart	6.52	1.8	0.1000
23	Shewhart	6.53	1.8	0.3000
24	Shewhart	6.53	1.8	0.0100
25	Shewhart	6.53	1.8	0.0005
26	Shewhart	6.54	1.8	0.0500
27	Shewhart	6.54	1.8	0.5000
28	Shewhart	6.56	1.8	0.0010
29	bt	6.56	2.2	0.3000
30	DEWMA	6.65	1.4	0.2000
31	bt	7.19	2.1	0.0100
32	at	7.43	2.2	0.0100
33	Ft	7.44	2.3	0.0100
34	bt	7.71	2.5	0.0050
35	Ft	7.87	2.9	0.0050
36	at	7.90	2.9	0.0050
37	EWMA	8.15	2.5	0.0100
38	DEWMA	8.41	2.0	0.1000
39	bt	8.44	4.0	0.0010
40	Ft	8.46	4.2	0.0010
41	at	8.51	4.2	0.0010
42	bt	8.65	4.3	0.0005
43	Ft	8.66	4.4	0.0005
44	at	8.67	4.4	0.0005
45	Ft	8.68	1.9	0.5000
46	EWMA	9.04	3.1	0.0050
47	DEWMA	10.84	3.0	0.0500
48	EWMA	12.44	3.3	0.0010
49	EWMA	14.58	2.9	0.0005
50	DEWMA	22.98	30.4	0.0100
51	bt	50.78	90.8	0.5000
52	DEWMA	120.88	121.9	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-34

	Chart	ARL1	SD	Lambda
1	at	5.33	1.3	0.2000
2	Ft	5.34	1.3	0.2000
3	EWMA	5.35	1.3	0.3000
4	DEWMA	5.35	1.3	0.5000
5	at	5.38	1.4	0.3000
6	EWMA	5.40	1.3	0.2000
7	Ft	5.41	1.4	0.3000
8	EWMA	5.42	1.4	0.5000
9	Ft	5.56	1.3	0.1000
10	at	5.58	1.3	0.1000
11	bt	5.58	1.3	0.1000
12	bt	5.72	1.6	0.2000
13	at	5.75	1.6	0.5000
14	EWMA	5.89	1.3	0.1000
15	DEWMA	5.89	1.3	0.3000
16	bt	5.95	1.4	0.0500
17	Ft	6.07	1.4	0.0500
18	at	6.07	1.4	0.0500
19	EWMA	6.46	1.6	0.0500
20	Shewhart	6.51	1.8	0.1000
21	Shewhart	6.52	1.8	0.0100
22	Shewhart	6.52	1.8	0.5000
23	Shewhart	6.53	1.8	0.0005
24	Shewhart	6.53	1.8	0.0050
25	Shewhart	6.53	1.8	0.0500
26	Shewhart	6.53	1.8	0.2000
27	Shewhart	6.54	1.8	0.0010
28	Shewhart	6.55	1.8	0.3000
29	bt	6.57	2.2	0.3000
30	DEWMA	6.64	1.4	0.2000
31	bt	7.19	2.0	0.0100
32	at	7.40	2.3	0.0100
33	Ft	7.40	2.3	0.0100
34	bt	7.72	2.5	0.0050
35	Ft	7.87	2.9	0.0050
36	at	7.90	2.9	0.0050
37	EWMA	8.12	2.6	0.0100
38	DEWMA	8.42	2.0	0.1000
39	bt	8.43	4.0	0.0010
40	Ft	8.45	4.2	0.0010
41	at	8.50	4.2	0.0010
42	bt	8.58	4.3	0.0005
43	Ft	8.60	4.4	0.0005
44	at	8.60	4.4	0.0005
45	Ft	8.67	1.9	0.5000
46	EWMA	9.03	3.1	0.0050
47	DEWMA	10.84	3.0	0.0500
48	EWMA	12.44	3.3	0.0010
49	EWMA	14.54	2.9	0.0005
50	DEWMA	22.90	30.2	0.0100
51	bt	50.43	90.6	0.5000
52	DEWMA	119.31	121.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-35

	Chart	ARL1	SD	Lambda
1	Ft	4.97	1.2	0.2000
2	at	4.97	1.2	0.2000
3	EWMA	4.98	1.2	0.3000
4	at	4.98	1.3	0.3000
5	DEWMA	4.99	1.1	0.5000
6	EWMA	5.01	1.3	0.5000
7	Ft	5.01	1.3	0.3000
8	EWMA	5.08	1.2	0.2000
9	bt	5.20	1.2	0.1000
10	Ft	5.21	1.2	0.1000
11	at	5.23	1.2	0.1000
12	bt	5.26	1.4	0.2000
13	at	5.27	1.4	0.5000
14	EWMA	5.53	1.3	0.1000
15	DEWMA	5.54	1.2	0.3000
16	bt	5.55	1.3	0.0500
17	Ft	5.68	1.3	0.0500
18	at	5.69	1.3	0.0500
19	bt	5.91	1.9	0.3000
20	Shewhart	5.95	1.7	0.3000
21	Shewhart	5.96	1.7	0.1000
22	Shewhart	5.96	1.6	0.2000
23	Shewhart	5.96	1.7	0.5000
24	Shewhart	5.97	1.6	0.0050
25	Shewhart	5.97	1.7	0.0500
26	Shewhart	5.98	1.7	0.0005
27	Shewhart	5.98	1.7	0.0100
28	Shewhart	6.00	1.7	0.0010
29	EWMA	6.07	1.5	0.0500
30	DEWMA	6.33	1.3	0.2000
31	bt	6.77	1.9	0.0100
32	at	6.99	2.1	0.0100
33	Ft	7.00	2.1	0.0100
34	bt	7.33	2.3	0.0050
35	Ft	7.49	2.7	0.0050
36	at	7.52	2.7	0.0050
37	EWMA	7.66	2.4	0.0100
38	Ft	7.81	1.8	0.5000
39	bt	7.95	3.8	0.0010
40	Ft	7.96	4.0	0.0010
41	at	8.01	3.9	0.0010
42	DEWMA	8.06	1.9	0.1000
43	bt	8.21	4.1	0.0005
44	Ft	8.23	4.2	0.0005
45	at	8.23	4.1	0.0005
46	EWMA	8.61	2.9	0.0050
47	DEWMA	10.39	2.9	0.0500
48	EWMA	11.72	3.1	0.0010
49	EWMA	13.78	2.7	0.0005
50	DEWMA	19.68	17.0	0.0100
51	bt	27.59	62.2	0.5000
52	DEWMA	101.72	116.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-35

	Chart	ARL1	SD	Lambda
1	EWMA	4.98	1.2	0.3000
2	Ft	4.99	1.2	0.2000
3	at	4.99	1.3	0.3000
4	at	4.99	1.2	0.2000
5	DEWMA	5.00	1.1	0.5000
6	Ft	5.01	1.3	0.3000
7	EWMA	5.02	1.3	0.5000
8	EWMA	5.08	1.2	0.2000
9	Ft	5.20	1.2	0.1000
10	bt	5.20	1.2	0.1000
11	at	5.23	1.2	0.1000
12	bt	5.27	1.4	0.2000
13	at	5.28	1.4	0.5000
14	EWMA	5.51	1.3	0.1000
15	DEWMA	5.54	1.2	0.3000
16	bt	5.55	1.3	0.0500
17	Ft	5.68	1.3	0.0500
18	at	5.69	1.3	0.0500
19	bt	5.92	1.9	0.3000
20	Shewhart	5.95	1.7	0.0500
21	Shewhart	5.96	1.7	0.5000
22	Shewhart	5.97	1.7	0.0050
23	Shewhart	5.97	1.6	0.2000
24	Shewhart	5.97	1.7	0.0005
25	Shewhart	5.97	1.7	0.3000
26	Shewhart	5.97	1.7	0.0100
27	Shewhart	5.97	1.7	0.1000
28	Shewhart	5.98	1.6	0.0010
29	EWMA	6.07	1.5	0.0500
30	DEWMA	6.31	1.3	0.2000
31	bt	6.77	1.9	0.0100
32	at	6.99	2.1	0.0100
33	Ft	7.00	2.1	0.0100
34	bt	7.28	2.3	0.0050
35	Ft	7.43	2.7	0.0050
36	at	7.45	2.7	0.0050
37	EWMA	7.68	2.4	0.0100
38	Ft	7.82	1.8	0.5000
39	DEWMA	8.00	1.9	0.1000
40	bt	8.03	3.7	0.0010
41	Ft	8.05	3.9	0.0010
42	at	8.10	3.9	0.0010
43	bt	8.11	4.1	0.0005
44	Ft	8.12	4.2	0.0005
45	at	8.13	4.2	0.0005
46	EWMA	8.54	2.8	0.0050
47	DEWMA	10.40	2.8	0.0500
48	EWMA	11.79	3.1	0.0010
49	EWMA	13.72	2.8	0.0005
50	DEWMA	19.94	18.7	0.0100
51	bt	26.77	60.4	0.5000
52	DEWMA	100.25	115.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-36

	Chart	ARL1	SD	Lambda
1	Ft	4.64	1.1	0.2000
2	at	4.65	1.1	0.2000
3	at	4.65	1.2	0.3000
4	EWMA	4.67	1.1	0.3000
5	Ft	4.68	1.2	0.3000
6	EWMA	4.70	1.2	0.5000
7	DEWMA	4.71	1.1	0.5000
8	EWMA	4.75	1.1	0.2000
9	bt	4.88	1.3	0.2000
10	at	4.91	1.3	0.5000
11	bt	4.92	1.1	0.1000
12	Ft	4.93	1.1	0.1000
13	at	4.95	1.1	0.1000
14	EWMA	5.22	1.2	0.1000
15	bt	5.24	1.2	0.0500
16	DEWMA	5.26	1.1	0.3000
17	Ft	5.35	1.3	0.0500
18	at	5.37	1.3	0.0500
19	bt	5.39	1.7	0.3000
20	Shewhart	5.50	1.5	0.0050
21	Shewhart	5.50	1.5	0.2000
22	Shewhart	5.50	1.5	0.0500
23	Shewhart	5.52	1.5	0.5000
24	Shewhart	5.52	1.5	0.0010
25	Shewhart	5.52	1.5	0.3000
26	Shewhart	5.53	1.5	0.0005
27	Shewhart	5.53	1.5	0.0100
28	Shewhart	5.54	1.5	0.1000
29	EWMA	5.71	1.4	0.0500
30	DEWMA	6.01	1.3	0.2000
31	bt	6.42	1.8	0.0100
32	at	6.62	2.0	0.0100
33	Ft	6.63	2.0	0.0100
34	bt	6.95	2.2	0.0050
35	Ft	7.10	2.6	0.0050
36	at	7.11	2.5	0.0050
37	Ft	7.13	1.6	0.5000
38	EWMA	7.28	2.3	0.0100
39	bt	7.61	3.6	0.0010
40	Ft	7.63	3.8	0.0010
41	bt	7.64	3.9	0.0005
42	Ft	7.65	4.0	0.0005
43	at	7.65	4.0	0.0005
44	at	7.68	3.7	0.0010
45	DEWMA	7.68	1.8	0.1000
46	EWMA	8.13	2.7	0.0050
47	DEWMA	9.89	2.8	0.0500
48	EWMA	11.19	2.9	0.0010
49	EWMA	13.00	2.6	0.0005
50	bt	14.81	34.5	0.5000
51	DEWMA	18.26	9.9	0.0100
52	DEWMA	82.61	106.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-36

	Chart	ARL1	SD	Lambda
1	Ft	4.65	1.1	0.2000
2	at	4.65	1.2	0.3000
3	at	4.65	1.1	0.2000
4	Ft	4.67	1.2	0.3000
5	EWMA	4.68	1.2	0.5000
6	EWMA	4.68	1.1	0.3000
7	DEWMA	4.70	1.1	0.5000
8	EWMA	4.76	1.1	0.2000
9	bt	4.89	1.3	0.2000
10	bt	4.90	1.1	0.1000
11	Ft	4.91	1.1	0.1000
12	at	4.91	1.3	0.5000
13	at	4.93	1.1	0.1000
14	EWMA	5.21	1.2	0.1000
15	bt	5.25	1.2	0.0500
16	DEWMA	5.27	1.1	0.3000
17	Ft	5.38	1.3	0.0500
18	bt	5.38	1.7	0.3000
19	at	5.38	1.3	0.0500
20	Shewhart	5.50	1.5	0.2000
21	Shewhart	5.50	1.5	0.3000
22	Shewhart	5.51	1.5	0.0050
23	Shewhart	5.52	1.5	0.1000
24	Shewhart	5.52	1.5	0.0005
25	Shewhart	5.53	1.5	0.0100
26	Shewhart	5.53	1.5	0.0010
27	Shewhart	5.54	1.5	0.0500
28	Shewhart	5.54	1.5	0.5000
29	EWMA	5.73	1.4	0.0500
30	DEWMA	5.99	1.3	0.2000
31	bt	6.37	1.8	0.0100
32	at	6.57	2.0	0.0100
33	Ft	6.58	2.0	0.0100
34	bt	6.90	2.2	0.0050
35	Ft	7.03	2.6	0.0050
36	at	7.06	2.6	0.0050
37	Ft	7.14	1.6	0.5000
38	EWMA	7.23	2.3	0.0100
39	bt	7.59	3.6	0.0010
40	Ft	7.59	3.7	0.0010
41	at	7.65	3.7	0.0010
42	DEWMA	7.66	1.8	0.1000
43	bt	7.77	3.8	0.0005
44	Ft	7.79	3.9	0.0005
45	at	7.79	3.9	0.0005
46	EWMA	8.07	2.8	0.0050
47	DEWMA	9.96	2.8	0.0500
48	EWMA	11.16	2.9	0.0010
49	EWMA	13.07	2.6	0.0005
50	bt	14.68	34.2	0.5000
51	DEWMA	18.19	9.6	0.0100
52	DEWMA	82.16	106.7	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-37

	Chart	ARL1	SD	Lambda
1	EWMA	4.37	1.1	0.5000
2	at	4.38	1.1	0.3000
3	Ft	4.39	1.1	0.3000
4	Ft	4.39	1.1	0.2000
5	at	4.40	1.0	0.2000
6	EWMA	4.42	1.0	0.3000
7	DEWMA	4.43	1.0	0.5000
8	EWMA	4.51	1.1	0.2000
9	at	4.56	1.2	0.5000
10	bt	4.60	1.2	0.2000
11	bt	4.63	1.1	0.1000
12	Ft	4.66	1.1	0.1000
13	at	4.67	1.1	0.1000
14	EWMA	4.95	1.1	0.1000
15	bt	4.96	1.2	0.0500
16	bt	4.99	1.5	0.3000
17	DEWMA	5.03	1.1	0.3000
18	Ft	5.10	1.2	0.0500
19	Shewhart	5.10	1.4	0.0500
20	at	5.11	1.2	0.0500
21	Shewhart	5.11	1.4	0.0005
22	Shewhart	5.12	1.4	0.0010
23	Shewhart	5.12	1.4	0.5000
24	Shewhart	5.13	1.4	0.0100
25	Shewhart	5.13	1.4	0.0050
26	Shewhart	5.13	1.4	0.1000
27	Shewhart	5.13	1.4	0.3000
28	Shewhart	5.14	1.4	0.2000
29	EWMA	5.45	1.3	0.0500
30	DEWMA	5.75	1.2	0.2000
31	bt	6.09	1.7	0.0100
32	at	6.27	1.9	0.0100
33	Ft	6.28	1.9	0.0100
34	Ft	6.56	1.5	0.5000
35	bt	6.60	2.1	0.0050
36	Ft	6.75	2.5	0.0050
37	at	6.77	2.4	0.0050
38	EWMA	6.89	2.2	0.0100
39	bt	7.19	3.4	0.0010
40	Ft	7.21	3.6	0.0010
41	at	7.25	3.5	0.0010
42	bt	7.32	3.7	0.0005
43	Ft	7.33	3.8	0.0005
44	at	7.34	3.8	0.0005
45	DEWMA	7.37	1.8	0.1000
46	EWMA	7.75	2.6	0.0050
47	DEWMA	9.59	2.6	0.0500
48	bt	9.62	15.1	0.5000
49	EWMA	10.61	2.8	0.0010
50	EWMA	12.41	2.5	0.0005
51	DEWMA	17.54	8.3	0.0100
52	DEWMA	68.31	96.9	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-37

	Chart	ARL1	SD	Lambda
1	at	4.35	1.1	0.3000
2	Ft	4.37	1.1	0.3000
3	Ft	4.39	1.1	0.2000
4	EWMA	4.39	1.1	0.5000
5	at	4.40	1.0	0.2000
6	EWMA	4.41	1.0	0.3000
7	DEWMA	4.44	1.0	0.5000
8	EWMA	4.50	1.1	0.2000
9	at	4.57	1.2	0.5000
10	bt	4.61	1.2	0.2000
11	bt	4.65	1.1	0.1000
12	Ft	4.67	1.1	0.1000
13	at	4.69	1.0	0.1000
14	bt	4.96	1.5	0.3000
15	EWMA	4.98	1.1	0.1000
16	bt	4.99	1.2	0.0500
17	DEWMA	5.02	1.1	0.3000
18	Ft	5.11	1.2	0.0500
19	at	5.12	1.2	0.0500
20	Shewhart	5.12	1.4	0.3000
21	Shewhart	5.12	1.4	0.2000
22	Shewhart	5.12	1.4	0.0100
23	Shewhart	5.13	1.4	0.0010
24	Shewhart	5.13	1.4	0.0050
25	Shewhart	5.13	1.4	0.1000
26	Shewhart	5.13	1.4	0.0500
27	Shewhart	5.13	1.4	0.5000
28	Shewhart	5.17	1.4	0.0005
29	EWMA	5.45	1.3	0.0500
30	DEWMA	5.74	1.2	0.2000
31	bt	6.09	1.7	0.0100
32	at	6.30	1.9	0.0100
33	Ft	6.30	1.9	0.0100
34	Ft	6.57	1.5	0.5000
35	bt	6.61	2.1	0.0050
36	Ft	6.74	2.5	0.0050
37	at	6.76	2.4	0.0050
38	EWMA	6.91	2.1	0.0100
39	bt	7.24	3.4	0.0010
40	Ft	7.26	3.6	0.0010
41	at	7.30	3.6	0.0010
42	bt	7.34	3.7	0.0005
43	Ft	7.36	3.8	0.0005
44	at	7.36	3.8	0.0005
45	DEWMA	7.44	1.7	0.1000
46	EWMA	7.73	2.6	0.0050
47	DEWMA	9.56	2.6	0.0500
48	bt	9.61	15.0	0.5000
49	EWMA	10.65	2.8	0.0010
50	EWMA	12.41	2.5	0.0005
51	DEWMA	17.57	7.8	0.0100
52	DEWMA	67.57	96.5	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-38

	Chart	ARL1	SD	Lambda
1	Ft	4.16	1.0	0.2000
2	EWMA	4.16	1.0	0.5000
3	at	4.16	1.0	0.3000
4	Ft	4.17	1.0	0.3000
5	at	4.18	1.0	0.2000
6	EWMA	4.23	1.0	0.3000
7	DEWMA	4.24	1.0	0.5000
8	EWMA	4.30	1.0	0.2000
9	bt	4.31	1.1	0.2000
10	at	4.32	1.2	0.5000
11	bt	4.41	1.0	0.1000
12	Ft	4.46	1.0	0.1000
13	at	4.47	1.0	0.1000
14	bt	4.64	1.4	0.3000
15	EWMA	4.74	1.1	0.1000
16	bt	4.76	1.1	0.0500
17	Shewhart	4.78	1.3	0.0050
18	Shewhart	4.79	1.3	0.0500
19	Shewhart	4.81	1.3	0.0005
20	Shewhart	4.81	1.3	0.3000
21	Shewhart	4.81	1.3	0.2000
22	Shewhart	4.81	1.3	0.5000
23	Shewhart	4.82	1.3	0.1000
24	Shewhart	4.82	1.3	0.0010
25	Shewhart	4.82	1.3	0.0100
26	DEWMA	4.85	1.0	0.3000
27	Ft	4.88	1.1	0.0500
28	at	4.89	1.1	0.0500
29	EWMA	5.22	1.3	0.0500
30	DEWMA	5.54	1.2	0.2000
31	bt	5.82	1.7	0.0100
32	at	6.02	1.8	0.0100
33	Ft	6.03	1.8	0.0100
34	Ft	6.11	1.4	0.5000
35	bt	6.29	2.0	0.0050
36	Ft	6.43	2.3	0.0050
37	at	6.45	2.3	0.0050
38	EWMA	6.63	2.1	0.0100
39	bt	6.88	3.3	0.0010
40	Ft	6.89	3.4	0.0010
41	at	6.93	3.4	0.0010
42	bt	7.02	3.5	0.0005
43	Ft	7.02	3.6	0.0005
44	at	7.03	3.6	0.0005
45	DEWMA	7.15	1.6	0.1000
46	EWMA	7.38	2.5	0.0050
47	bt	7.68	5.3	0.5000
48	DEWMA	9.27	2.6	0.0500
49	EWMA	10.15	2.7	0.0010
50	EWMA	11.88	2.4	0.0005
51	DEWMA	17.08	7.6	0.0100
52	DEWMA	55.26	85.2	0.0050
53	DEWMA	269.98	2.4	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-38

	Chart	ARL1	SD	Lambda
1	at	4.15	1.0	0.3000
2	EWMA	4.16	1.0	0.5000
3	Ft	4.16	1.1	0.3000
4	Ft	4.16	1.0	0.2000
5	at	4.17	1.0	0.2000
6	EWMA	4.20	1.0	0.3000
7	DEWMA	4.22	1.0	0.5000
8	EWMA	4.29	1.0	0.2000
9	at	4.31	1.1	0.5000
10	bt	4.33	1.1	0.2000
11	bt	4.40	1.0	0.1000
12	Ft	4.44	1.0	0.1000
13	at	4.45	1.0	0.1000
14	bt	4.66	1.4	0.3000
15	EWMA	4.73	1.1	0.1000
16	bt	4.78	1.1	0.0500
17	Shewhart	4.78	1.3	0.1000
18	Shewhart	4.79	1.3	0.5000
19	Shewhart	4.79	1.3	0.2000
20	Shewhart	4.80	1.3	0.0010
21	Shewhart	4.81	1.3	0.0050
22	Shewhart	4.81	1.3	0.0500
23	Shewhart	4.81	1.3	0.0100
24	Shewhart	4.82	1.3	0.3000
25	Shewhart	4.82	1.3	0.0005
26	DEWMA	4.82	1.0	0.3000
27	Ft	4.89	1.1	0.0500
28	at	4.90	1.1	0.0500
29	EWMA	5.23	1.3	0.0500
30	DEWMA	5.55	1.2	0.2000
31	bt	5.84	1.7	0.0100
32	at	6.04	1.8	0.0100
33	Ft	6.05	1.9	0.0100
34	Ft	6.09	1.4	0.5000
35	bt	6.31	2.0	0.0050
36	Ft	6.44	2.4	0.0050
37	at	6.46	2.3	0.0050
38	EWMA	6.63	2.1	0.0100
39	bt	6.91	3.2	0.0010
40	Ft	6.93	3.4	0.0010
41	at	6.97	3.4	0.0010
42	bt	7.08	3.6	0.0005
43	Ft	7.08	3.6	0.0005
44	at	7.09	3.6	0.0005
45	DEWMA	7.14	1.7	0.1000
46	EWMA	7.40	2.5	0.0050
47	bt	7.69	5.4	0.5000
48	DEWMA	9.28	2.6	0.0500
49	EWMA	10.18	2.7	0.0010
50	EWMA	11.92	2.4	0.0005
51	DEWMA	17.08	7.3	0.0100
52	DEWMA	54.11	83.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-39

	Chart	ARL1	SD	Lambda
1	EWMA	3.91	1.0	0.5000
2	at	3.93	0.9	0.3000
3	Ft	3.93	1.0	0.3000
4	Ft	3.97	0.9	0.2000
5	at	3.97	0.9	0.2000
6	EWMA	4.00	0.9	0.3000
7	DEWMA	4.02	0.9	0.5000
8	at	4.04	1.1	0.5000
9	bt	4.09	1.0	0.2000
10	EWMA	4.10	0.9	0.2000
11	bt	4.21	1.0	0.1000
12	Ft	4.26	1.0	0.1000
13	at	4.27	1.0	0.1000
14	bt	4.34	1.3	0.3000
15	Shewhart	4.50	1.2	0.5000
16	Shewhart	4.51	1.2	0.2000
17	Shewhart	4.52	1.2	0.0100
18	Shewhart	4.52	1.2	0.3000
19	Shewhart	4.52	1.2	0.0005
20	Shewhart	4.52	1.2	0.0050
21	Shewhart	4.53	1.2	0.1000
22	EWMA	4.54	1.0	0.1000
23	Shewhart	4.54	1.2	0.0500
24	Shewhart	4.55	1.2	0.0010
25	bt	4.57	1.1	0.0500
26	DEWMA	4.63	1.0	0.3000
27	Ft	4.68	1.1	0.0500
28	at	4.69	1.1	0.0500
29	EWMA	5.01	1.2	0.0500
30	DEWMA	5.34	1.1	0.2000
31	bt	5.62	1.6	0.0100
32	Ft	5.68	1.3	0.5000
33	at	5.81	1.8	0.0100
34	Ft	5.82	1.8	0.0100
35	bt	6.06	2.0	0.0050
36	Ft	6.19	2.3	0.0050
37	at	6.21	2.2	0.0050
38	EWMA	6.38	2.0	0.0100
39	bt	6.59	3.1	0.0010
40	Ft	6.59	3.3	0.0010
41	at	6.64	3.3	0.0010
42	bt	6.72	3.1	0.5000
43	bt	6.78	3.4	0.0005
44	Ft	6.79	3.5	0.0005
45	at	6.80	3.5	0.0005
46	DEWMA	6.92	1.6	0.1000
47	EWMA	7.12	2.4	0.0050
48	DEWMA	9.00	2.5	0.0500
49	EWMA	9.74	2.6	0.0010
50	EWMA	11.42	2.3	0.0005
51	DEWMA	16.52	6.6	0.0100
52	DEWMA	44.48	72.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-39

	Chart	ARL1	SD	Lambda
1	Ft	3.92	1.0	0.3000
2	at	3.92	0.9	0.3000
3	EWMA	3.93	1.0	0.5000
4	Ft	3.98	0.9	0.2000
5	EWMA	3.99	0.9	0.3000
6	at	3.99	0.9	0.2000
7	DEWMA	4.03	0.9	0.5000
8	at	4.07	1.1	0.5000
9	EWMA	4.10	1.0	0.2000
10	bt	4.12	1.0	0.2000
11	bt	4.22	1.0	0.1000
12	Ft	4.26	1.0	0.1000
13	at	4.27	1.0	0.1000
14	bt	4.33	1.2	0.3000
15	Shewhart	4.50	1.2	0.0010
16	Shewhart	4.51	1.2	0.3000
17	Shewhart	4.51	1.2	0.2000
18	Shewhart	4.51	1.3	0.0050
19	Shewhart	4.53	1.2	0.5000
20	Shewhart	4.53	1.3	0.1000
21	Shewhart	4.53	1.3	0.0500
22	Shewhart	4.54	1.2	0.0100
23	Shewhart	4.54	1.2	0.0005
24	EWMA	4.54	1.0	0.1000
25	bt	4.54	1.1	0.0500
26	DEWMA	4.64	1.0	0.3000
27	Ft	4.67	1.1	0.0500
28	at	4.68	1.1	0.0500
29	EWMA	5.00	1.2	0.0500
30	DEWMA	5.33	1.1	0.2000
31	bt	5.61	1.6	0.0100
32	Ft	5.69	1.3	0.5000
33	at	5.80	1.7	0.0100
34	Ft	5.81	1.7	0.0100
35	bt	6.06	2.0	0.0050
36	Ft	6.17	2.3	0.0050
37	at	6.20	2.3	0.0050
38	EWMA	6.38	2.0	0.0100
39	bt	6.65	3.1	0.0010
40	Ft	6.67	3.3	0.0010
41	bt	6.69	3.1	0.5000
42	at	6.71	3.3	0.0010
43	bt	6.79	3.4	0.0005
44	Ft	6.80	3.5	0.0005
45	at	6.80	3.5	0.0005
46	DEWMA	6.91	1.7	0.1000
47	EWMA	7.10	2.4	0.0050
48	DEWMA	8.98	2.5	0.0500
49	EWMA	9.78	2.6	0.0010
50	EWMA	11.46	2.3	0.0005
51	DEWMA	16.54	6.6	0.0100
52	DEWMA	44.25	71.9	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-40

	Chart	ARL1	SD	Lambda
1	Ft	3.74	0.9	0.3000
2	at	3.74	0.9	0.3000
3	EWMA	3.76	0.9	0.5000
4	Ft	3.80	0.9	0.2000
5	at	3.80	0.9	0.2000
6	EWMA	3.83	0.9	0.3000
7	at	3.85	1.0	0.5000
8	DEWMA	3.88	0.9	0.5000
9	bt	3.91	1.0	0.2000
10	EWMA	3.94	0.9	0.2000
11	bt	4.04	0.9	0.1000
12	Ft	4.09	0.9	0.1000
13	at	4.10	0.9	0.1000
14	bt	4.11	1.2	0.3000
15	Shewhart	4.26	1.2	0.0050
16	Shewhart	4.27	1.2	0.0100
17	Shewhart	4.27	1.2	0.2000
18	Shewhart	4.28	1.2	0.5000
19	Shewhart	4.28	1.2	0.0500
20	Shewhart	4.28	1.2	0.3000
21	Shewhart	4.29	1.2	0.0010
22	Shewhart	4.30	1.2	0.1000
23	Shewhart	4.31	1.2	0.0005
24	EWMA	4.37	1.0	0.1000
25	bt	4.39	1.0	0.0500
26	DEWMA	4.48	0.9	0.3000
27	Ft	4.52	1.1	0.0500
28	at	4.53	1.0	0.0500
29	EWMA	4.84	1.2	0.0500
30	DEWMA	5.17	1.1	0.2000
31	Ft	5.34	1.2	0.5000
32	bt	5.39	1.5	0.0100
33	at	5.56	1.7	0.0100
34	Ft	5.57	1.7	0.0100
35	bt	5.83	1.9	0.0050
36	Ft	5.96	2.2	0.0050
37	at	5.98	2.2	0.0050
38	bt	5.99	2.7	0.5000
39	EWMA	6.13	1.9	0.0100
40	bt	6.37	3.0	0.0010
41	Ft	6.40	3.2	0.0010
42	at	6.44	3.2	0.0010
43	bt	6.50	3.3	0.0005
44	Ft	6.51	3.3	0.0005
45	at	6.52	3.3	0.0005
46	DEWMA	6.73	1.6	0.1000
47	EWMA	6.84	2.3	0.0050
48	DEWMA	8.81	2.4	0.0500
49	EWMA	9.40	2.5	0.0010
50	EWMA	11.00	2.2	0.0005
51	DEWMA	16.17	6.4	0.0100
52	DEWMA	36.25	59.4	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-40

	Chart	ARL1	SD	Lambda
1	at	3.75	0.9	0.3000
2	EWMA	3.75	0.9	0.5000
3	Ft	3.75	0.9	0.3000
4	Ft	3.80	0.9	0.2000
5	at	3.81	0.9	0.2000
6	EWMA	3.82	0.9	0.3000
7	at	3.86	1.0	0.5000
8	DEWMA	3.88	0.9	0.5000
9	bt	3.93	1.0	0.2000
10	EWMA	3.94	0.9	0.2000
11	bt	4.03	0.9	0.1000
12	Ft	4.08	0.9	0.1000
13	at	4.09	0.9	0.1000
14	bt	4.11	1.2	0.3000
15	Shewhart	4.25	1.2	0.1000
16	Shewhart	4.26	1.2	0.0050
17	Shewhart	4.26	1.2	0.0500
18	Shewhart	4.27	1.2	0.0005
19	Shewhart	4.27	1.2	0.5000
20	Shewhart	4.28	1.2	0.3000
21	Shewhart	4.29	1.2	0.2000
22	Shewhart	4.29	1.2	0.0010
23	Shewhart	4.29	1.2	0.0100
24	bt	4.36	1.0	0.0500
25	EWMA	4.36	1.0	0.1000
26	DEWMA	4.46	0.9	0.3000
27	Ft	4.47	1.1	0.0500
28	at	4.49	1.1	0.0500
29	EWMA	4.80	1.2	0.0500
30	DEWMA	5.17	1.1	0.2000
31	Ft	5.34	1.2	0.5000
32	bt	5.44	1.5	0.0100
33	at	5.62	1.6	0.0100
34	Ft	5.63	1.7	0.0100
35	bt	5.83	1.9	0.0050
36	Ft	5.95	2.2	0.0050
37	at	5.97	2.1	0.0050
38	bt	6.01	2.6	0.5000
39	EWMA	6.18	1.9	0.0100
40	bt	6.42	3.0	0.0010
41	Ft	6.43	3.2	0.0010
42	at	6.47	3.1	0.0010
43	bt	6.52	3.2	0.0005
44	Ft	6.52	3.3	0.0005
45	at	6.53	3.3	0.0005
46	DEWMA	6.72	1.6	0.1000
47	EWMA	6.84	2.3	0.0050
48	DEWMA	8.78	2.4	0.0500
49	EWMA	9.44	2.5	0.0010
50	EWMA	11.01	2.2	0.0005
51	DEWMA	16.24	6.3	0.0100
52	DEWMA	36.42	59.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-41

	Chart	ARL1	SD	Lambda
1	EWMA	3.60	0.9	0.5000
2	at	3.60	0.9	0.3000
3	Ft	3.61	0.9	0.3000
4	Ft	3.64	0.9	0.2000
5	at	3.65	0.8	0.2000
6	at	3.68	1.0	0.5000
7	EWMA	3.68	0.9	0.3000
8	DEWMA	3.73	0.8	0.5000
9	bt	3.74	0.9	0.2000
10	EWMA	3.78	0.9	0.2000
11	bt	3.88	0.9	0.1000
12	bt	3.92	1.1	0.3000
13	Ft	3.93	0.9	0.1000
14	at	3.95	0.9	0.1000
15	Shewhart	4.04	1.1	0.0050
16	Shewhart	4.04	1.1	0.0010
17	Shewhart	4.05	1.1	0.0500
18	Shewhart	4.05	1.1	0.0100
19	Shewhart	4.05	1.1	0.2000
20	Shewhart	4.05	1.1	0.0005
21	Shewhart	4.06	1.1	0.5000
22	Shewhart	4.07	1.1	0.3000
23	Shewhart	4.07	1.1	0.1000
24	EWMA	4.20	1.0	0.1000
25	bt	4.22	1.0	0.0500
26	Ft	4.34	1.0	0.0500
27	DEWMA	4.34	0.9	0.3000
28	at	4.35	1.0	0.0500
29	EWMA	4.65	1.1	0.0500
30	DEWMA	5.00	1.1	0.2000
31	Ft	5.04	1.1	0.5000
32	bt	5.21	1.5	0.0100
33	at	5.39	1.6	0.0100
34	Ft	5.39	1.6	0.0100
35	bt	5.47	2.3	0.5000
36	bt	5.64	1.8	0.0050
37	Ft	5.76	2.1	0.0050
38	at	5.78	2.1	0.0050
39	EWMA	5.92	1.9	0.0100
40	bt	6.13	2.9	0.0010
41	Ft	6.15	3.1	0.0010
42	at	6.18	3.0	0.0010
43	bt	6.37	3.1	0.0005
44	Ft	6.37	3.2	0.0005
45	at	6.38	3.2	0.0005
46	DEWMA	6.53	1.5	0.1000
47	EWMA	6.61	2.2	0.0050
48	DEWMA	8.55	2.3	0.0500
49	EWMA	9.08	2.4	0.0010
50	EWMA	10.68	2.1	0.0005
51	DEWMA	15.73	6.3	0.0100
52	DEWMA	30.59	48.3	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-41

	Chart	ARL1	SD	Lambda
1	Ft	3.59	0.9	0.3000
2	at	3.59	0.9	0.3000
3	EWMA	3.61	0.9	0.5000
4	Ft	3.65	0.9	0.2000
5	at	3.66	0.8	0.2000
6	EWMA	3.68	0.8	0.3000
7	at	3.68	1.0	0.5000
8	DEWMA	3.74	0.8	0.5000
9	bt	3.74	0.9	0.2000
10	EWMA	3.79	0.9	0.2000
11	bt	3.86	0.9	0.1000
12	bt	3.90	1.1	0.3000
13	Ft	3.92	0.9	0.1000
14	at	3.94	0.9	0.1000
15	Shewhart	4.04	1.1	0.0500
16	Shewhart	4.05	1.1	0.2000
17	Shewhart	4.05	1.1	0.0005
18	Shewhart	4.06	1.1	0.0050
19	Shewhart	4.06	1.1	0.0010
20	Shewhart	4.06	1.1	0.3000
21	Shewhart	4.07	1.1	0.0100
22	Shewhart	4.07	1.1	0.1000
23	Shewhart	4.08	1.1	0.5000
24	EWMA	4.20	1.0	0.1000
25	bt	4.21	1.0	0.0500
26	DEWMA	4.33	0.9	0.3000
27	Ft	4.33	1.0	0.0500
28	at	4.33	1.0	0.0500
29	EWMA	4.64	1.2	0.0500
30	DEWMA	5.02	1.1	0.2000
31	Ft	5.04	1.1	0.5000
32	bt	5.19	1.5	0.0100
33	at	5.36	1.6	0.0100
34	Ft	5.37	1.7	0.0100
35	bt	5.49	2.3	0.5000
36	bt	5.63	1.8	0.0050
37	Ft	5.75	2.1	0.0050
38	at	5.77	2.1	0.0050
39	EWMA	5.90	1.9	0.0100
40	bt	6.14	2.9	0.0010
41	Ft	6.15	3.1	0.0010
42	at	6.19	3.1	0.0010
43	bt	6.34	3.1	0.0005
44	Ft	6.35	3.2	0.0005
45	at	6.35	3.2	0.0005
46	DEWMA	6.52	1.6	0.1000
47	EWMA	6.60	2.2	0.0050
48	DEWMA	8.52	2.4	0.0500
49	EWMA	9.07	2.4	0.0010
50	EWMA	10.66	2.1	0.0005
51	DEWMA	15.62	6.4	0.0100
52	DEWMA	30.63	48.6	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-42

	Chart	ARL1	SD	Lambda
1	at	3.45	0.8	0.3000
2	EWMA	3.45	0.8	0.5000
3	Ft	3.45	0.9	0.3000
4	Ft	3.51	0.8	0.2000
5	at	3.52	0.9	0.5000
6	at	3.52	0.8	0.2000
7	EWMA	3.54	0.8	0.3000
8	bt	3.59	0.9	0.2000
9	DEWMA	3.60	0.8	0.5000
10	EWMA	3.65	0.8	0.2000
11	bt	3.73	1.0	0.3000
12	bt	3.75	0.9	0.1000
13	Ft	3.80	0.9	0.1000
14	at	3.82	0.9	0.1000
15	Shewhart	3.86	1.1	0.0100
16	Shewhart	3.87	1.1	0.0050
17	Shewhart	3.87	1.1	0.0005
18	Shewhart	3.87	1.1	0.1000
19	Shewhart	3.87	1.1	0.0500
20	Shewhart	3.87	1.1	0.2000
21	Shewhart	3.87	1.1	0.3000
22	Shewhart	3.88	1.1	0.0010
23	Shewhart	3.89	1.1	0.5000
24	EWMA	4.07	0.9	0.1000
25	bt	4.09	1.0	0.0500
26	DEWMA	4.21	0.9	0.3000
27	Ft	4.22	1.0	0.0500
28	at	4.22	1.0	0.0500
29	EWMA	4.53	1.1	0.0500
30	Ft	4.78	1.1	0.5000
31	DEWMA	4.89	1.0	0.2000
32	bt	5.04	2.0	0.5000
33	bt	5.05	1.4	0.0100
34	at	5.22	1.6	0.0100
35	Ft	5.23	1.6	0.0100
36	bt	5.46	1.7	0.0050
37	Ft	5.56	2.0	0.0050
38	at	5.58	2.0	0.0050
39	EWMA	5.75	1.8	0.0100
40	bt	5.99	2.8	0.0010
41	Ft	6.01	2.9	0.0010
42	at	6.05	2.9	0.0010
43	bt	6.06	3.1	0.0005
44	Ft	6.07	3.1	0.0005
45	at	6.08	3.1	0.0005
46	DEWMA	6.37	1.5	0.1000
47	EWMA	6.39	2.1	0.0050
48	DEWMA	8.38	2.3	0.0500
49	EWMA	8.82	2.3	0.0010
50	EWMA	10.28	2.1	0.0005
51	DEWMA	15.37	6.2	0.0100
52	DEWMA	26.39	38.1	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-42

	Chart	ARL1	SD	Lambda
1	Ft	3.43	0.8	0.3000
2	EWMA	3.43	0.9	0.5000
3	at	3.44	0.8	0.3000
4	at	3.50	0.9	0.5000
5	Ft	3.51	0.8	0.2000
6	at	3.52	0.8	0.2000
7	EWMA	3.53	0.8	0.3000
8	DEWMA	3.59	0.8	0.5000
9	bt	3.59	0.9	0.2000
10	EWMA	3.67	0.8	0.2000
11	bt	3.70	1.0	0.3000
12	bt	3.73	0.9	0.1000
13	Ft	3.79	0.9	0.1000
14	at	3.81	0.9	0.1000
15	Shewhart	3.85	1.1	0.0100
16	Shewhart	3.86	1.1	0.3000
17	Shewhart	3.86	1.1	0.0500
18	Shewhart	3.86	1.1	0.5000
19	Shewhart	3.86	1.1	0.0050
20	Shewhart	3.86	1.1	0.1000
21	Shewhart	3.88	1.1	0.0005
22	Shewhart	3.88	1.1	0.0010
23	Shewhart	3.88	1.1	0.2000
24	EWMA	4.06	0.9	0.1000
25	bt	4.08	0.9	0.0500
26	DEWMA	4.20	0.9	0.3000
27	Ft	4.20	1.0	0.0500
28	at	4.21	1.0	0.0500
29	EWMA	4.50	1.1	0.0500
30	Ft	4.77	1.1	0.5000
31	DEWMA	4.89	1.0	0.2000
32	bt	5.03	1.4	0.0100
33	bt	5.03	2.0	0.5000
34	at	5.20	1.6	0.0100
35	Ft	5.21	1.6	0.0100
36	bt	5.47	1.8	0.0050
37	Ft	5.60	2.1	0.0050
38	at	5.62	2.0	0.0050
39	EWMA	5.72	1.8	0.0100
40	bt	5.97	2.8	0.0010
41	Ft	5.99	3.0	0.0010
42	at	6.02	2.9	0.0010
43	bt	6.11	3.0	0.0005
44	Ft	6.11	3.1	0.0005
45	at	6.12	3.1	0.0005
46	DEWMA	6.39	1.5	0.1000
47	EWMA	6.44	2.1	0.0050
48	DEWMA	8.33	2.3	0.0500
49	EWMA	8.80	2.3	0.0010
50	EWMA	10.30	2.0	0.0005
51	DEWMA	15.37	6.2	0.0100
52	DEWMA	26.61	38.2	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-43

	Chart	ARL1	SD	Lambda
1	EWMA	3.32	0.8	0.5000
2	at	3.33	0.8	0.3000
3	Ft	3.33	0.8	0.3000
4	at	3.37	0.9	0.5000
5	Ft	3.37	0.8	0.2000
6	at	3.39	0.8	0.2000
7	EWMA	3.42	0.8	0.3000
8	bt	3.45	0.8	0.2000
9	DEWMA	3.48	0.8	0.5000
10	EWMA	3.52	0.8	0.2000
11	bt	3.57	1.0	0.3000
12	bt	3.62	0.8	0.1000
13	Shewhart	3.68	1.0	0.0100
14	Ft	3.68	0.9	0.1000
15	Shewhart	3.68	1.0	0.2000
16	Shewhart	3.69	1.0	0.5000
17	at	3.69	0.8	0.1000
18	Shewhart	3.69	1.0	0.0010
19	Shewhart	3.70	1.0	0.0050
20	Shewhart	3.70	1.0	0.0005
21	Shewhart	3.71	1.0	0.1000
22	Shewhart	3.71	1.0	0.3000
23	Shewhart	3.72	1.0	0.0500
24	EWMA	3.93	0.9	0.1000
25	bt	3.96	0.9	0.0500
26	Ft	4.07	1.0	0.0500
27	at	4.08	0.9	0.0500
28	DEWMA	4.08	0.9	0.3000
29	EWMA	4.36	1.1	0.0500
30	Ft	4.54	1.0	0.5000
31	bt	4.67	1.8	0.5000
32	DEWMA	4.73	1.0	0.2000
33	bt	4.89	1.4	0.0100
34	at	5.04	1.5	0.0100
35	Ft	5.05	1.5	0.0100
36	bt	5.32	1.7	0.0050
37	Ft	5.41	2.0	0.0050
38	at	5.43	2.0	0.0050
39	EWMA	5.54	1.7	0.0100
40	bt	5.79	2.8	0.0010
41	Ft	5.80	2.9	0.0010
42	at	5.83	2.9	0.0010
43	bt	5.87	2.9	0.0005
44	Ft	5.87	3.0	0.0005
45	at	5.88	3.0	0.0005
46	DEWMA	6.20	1.5	0.1000
47	EWMA	6.22	2.1	0.0050
48	DEWMA	8.12	2.2	0.0500
49	EWMA	8.54	2.2	0.0010
50	EWMA	9.96	2.0	0.0005
51	DEWMA	14.92	6.1	0.0100
52	DEWMA	24.06	31.1	0.0050
53	DEWMA	269.95	3.4	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-43

	Chart	ARL1	SD	Lambda
1	Ft	3.33	0.8	0.3000
2	EWMA	3.33	0.8	0.5000
3	at	3.34	0.8	0.3000
4	at	3.38	0.9	0.5000
5	Ft	3.39	0.8	0.2000
6	at	3.40	0.8	0.2000
7	EWMA	3.43	0.8	0.3000
8	bt	3.46	0.9	0.2000
9	DEWMA	3.49	0.7	0.5000
10	EWMA	3.54	0.8	0.2000
11	bt	3.57	1.0	0.3000
12	bt	3.63	0.8	0.1000
13	Ft	3.67	0.8	0.1000
14	Shewhart	3.68	1.0	0.0100
15	Shewhart	3.68	1.0	0.0500
16	Shewhart	3.69	1.0	0.0050
17	at	3.69	0.8	0.1000
18	Shewhart	3.69	1.0	0.0005
19	Shewhart	3.69	1.0	0.0010
20	Shewhart	3.70	1.0	0.5000
21	Shewhart	3.70	1.0	0.2000
22	Shewhart	3.71	1.0	0.1000
23	Shewhart	3.71	1.0	0.3000
24	EWMA	3.93	0.9	0.1000
25	bt	3.95	0.9	0.0500
26	Ft	4.06	0.9	0.0500
27	at	4.07	0.9	0.0500
28	DEWMA	4.09	0.8	0.3000
29	EWMA	4.36	1.1	0.0500
30	Ft	4.54	1.0	0.5000
31	bt	4.68	1.8	0.5000
32	DEWMA	4.75	1.0	0.2000
33	bt	4.90	1.4	0.0100
34	at	5.07	1.5	0.0100
35	Ft	5.08	1.5	0.0100
36	bt	5.28	1.7	0.0050
37	Ft	5.40	2.0	0.0050
38	at	5.42	1.9	0.0050
39	EWMA	5.58	1.7	0.0100
40	bt	5.81	2.7	0.0010
41	Ft	5.82	2.9	0.0010
42	at	5.86	2.8	0.0010
43	bt	5.95	3.0	0.0005
44	Ft	5.96	3.0	0.0005
45	at	5.97	3.0	0.0005
46	DEWMA	6.20	1.5	0.1000
47	EWMA	6.20	2.1	0.0050
48	DEWMA	8.13	2.2	0.0500
49	EWMA	8.54	2.2	0.0010
50	EWMA	10.02	2.0	0.0005
51	DEWMA	15.07	6.0	0.0100
52	DEWMA	23.74	29.4	0.0050
53	DEWMA	269.98	2.4	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-44

	Chart	ARL1	SD	Lambda
1	EWMA	3.19	0.8	0.5000
2	Ft	3.21	0.8	0.3000
3	at	3.21	0.8	0.3000
4	at	3.24	0.8	0.5000
5	Ft	3.27	0.8	0.2000
6	at	3.29	0.8	0.2000
7	EWMA	3.31	0.8	0.3000
8	bt	3.32	0.8	0.2000
9	DEWMA	3.38	0.7	0.5000
10	EWMA	3.42	0.8	0.2000
11	bt	3.42	0.9	0.3000
12	bt	3.51	0.8	0.1000
13	Shewhart	3.53	1.0	0.5000
14	Shewhart	3.53	1.0	0.0010
15	Shewhart	3.54	1.0	0.0500
16	Shewhart	3.54	1.0	0.2000
17	Shewhart	3.54	1.0	0.1000
18	Shewhart	3.54	1.0	0.0005
19	Shewhart	3.54	1.0	0.3000
20	Shewhart	3.55	1.0	0.0050
21	Shewhart	3.56	1.0	0.0100
22	Ft	3.57	0.8	0.1000
23	at	3.58	0.8	0.1000
24	EWMA	3.82	0.9	0.1000
25	bt	3.83	0.9	0.0500
26	Ft	3.95	0.9	0.0500
27	at	3.96	0.9	0.0500
28	DEWMA	3.98	0.8	0.3000
29	EWMA	4.24	1.0	0.0500
30	Ft	4.34	1.0	0.5000
31	bt	4.37	1.6	0.5000
32	DEWMA	4.62	1.0	0.2000
33	bt	4.79	1.4	0.0100
34	at	4.94	1.5	0.0100
35	Ft	4.95	1.5	0.0100
36	bt	5.16	1.6	0.0050
37	Ft	5.27	1.9	0.0050
38	at	5.29	1.9	0.0050
39	EWMA	5.43	1.7	0.0100
40	bt	5.64	2.7	0.0010
41	Ft	5.66	2.8	0.0010
42	at	5.70	2.8	0.0010
43	bt	5.75	2.9	0.0005
44	Ft	5.77	2.9	0.0005
45	at	5.77	2.9	0.0005
46	EWMA	6.05	2.0	0.0050
47	DEWMA	6.09	1.4	0.1000
48	DEWMA	7.98	2.2	0.0500
49	EWMA	8.32	2.2	0.0010
50	EWMA	9.71	1.9	0.0005
51	DEWMA	14.73	5.9	0.0100
52	DEWMA	22.21	24.6	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B2-44

	Chart	ARL1	SD	Lambda
1	EWMA	3.20	0.8	0.5000
2	Ft	3.20	0.8	0.3000
3	at	3.21	0.8	0.3000
4	at	3.23	0.9	0.5000
5	Ft	3.29	0.8	0.2000
6	at	3.30	0.7	0.2000
7	EWMA	3.31	0.8	0.3000
8	bt	3.33	0.8	0.2000
9	DEWMA	3.37	0.8	0.5000
10	bt	3.41	0.9	0.3000
11	EWMA	3.43	0.8	0.2000
12	bt	3.49	0.8	0.1000
13	Shewhart	3.52	1.0	0.1000
14	Shewhart	3.53	1.0	0.3000
15	Shewhart	3.53	1.0	0.0010
16	Shewhart	3.54	1.0	0.0500
17	Shewhart	3.54	1.0	0.5000
18	Shewhart	3.54	1.0	0.2000
19	Shewhart	3.55	1.0	0.0005
20	Ft	3.55	0.8	0.1000
21	at	3.56	0.8	0.1000
22	Shewhart	3.56	1.0	0.0050
23	Shewhart	3.56	1.0	0.0100
24	EWMA	3.80	0.9	0.1000
25	bt	3.84	0.9	0.0500
26	Ft	3.94	0.9	0.0500
27	at	3.95	0.9	0.0500
28	DEWMA	3.98	0.8	0.3000
29	EWMA	4.23	1.1	0.0500
30	Ft	4.33	1.0	0.5000
31	bt	4.37	1.6	0.5000
32	DEWMA	4.65	1.0	0.2000
33	bt	4.75	1.4	0.0100
34	at	4.91	1.5	0.0100
35	Ft	4.93	1.5	0.0100
36	bt	5.17	1.6	0.0050
37	Ft	5.28	1.9	0.0050
38	at	5.29	1.9	0.0050
39	EWMA	5.41	1.7	0.0100
40	bt	5.63	2.7	0.0010
41	Ft	5.64	2.8	0.0010
42	at	5.68	2.8	0.0010
43	bt	5.79	2.8	0.0005
44	Ft	5.80	2.9	0.0005
45	at	5.81	2.9	0.0005
46	EWMA	6.06	2.0	0.0050
47	DEWMA	6.07	1.4	0.1000
48	DEWMA	7.97	2.2	0.0500
49	EWMA	8.30	2.2	0.0010
50	EWMA	9.73	1.9	0.0005
51	DEWMA	14.72	6.0	0.0100
52	DEWMA	22.03	23.3	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table B1-45

	Chart	ARL1	SD	Lambda
1	Ft	2.98	0.7	0.3000
2	at	2.99	0.7	0.3000
3	EWMA	3.00	0.7	0.5000
4	at	3.03	0.8	0.5000
5	Ft	3.09	0.7	0.2000
6	EWMA	3.10	0.7	0.3000
7	at	3.10	0.7	0.2000
8	bt	3.12	0.8	0.2000
9	bt	3.14	0.8	0.3000
10	DEWMA	3.18	0.7	0.5000
11	EWMA	3.24	0.7	0.2000
12	Shewhart	3.25	0.9	0.3000
13	Shewhart	3.26	0.9	0.1000
14	Shewhart	3.26	0.9	0.0500
15	Shewhart	3.27	0.9	0.0050
16	Shewhart	3.27	0.9	0.2000
17	Shewhart	3.28	0.9	0.0010
18	Shewhart	3.28	0.9	0.5000
19	Shewhart	3.29	0.9	0.0005
20	Shewhart	3.29	0.9	0.0100
21	bt	3.30	0.8	0.1000
22	Ft	3.36	0.8	0.1000
23	at	3.37	0.8	0.1000
24	EWMA	3.61	0.8	0.1000
25	bt	3.63	0.8	0.0500
26	Ft	3.73	0.9	0.0500
27	at	3.74	0.9	0.0500
28	DEWMA	3.78	0.8	0.3000
29	bt	3.92	1.4	0.5000
30	Ft	4.01	0.9	0.5000
31	EWMA	4.01	1.0	0.0500
32	DEWMA	4.43	1.0	0.2000
33	bt	4.51	1.3	0.0100
34	at	4.68	1.4	0.0100
35	Ft	4.69	1.4	0.0100
36	bt	4.88	1.5	0.0050
37	Ft	4.98	1.8	0.0050
38	at	4.99	1.8	0.0050
39	EWMA	5.16	1.6	0.0100
40	bt	5.35	2.5	0.0010
41	Ft	5.36	2.7	0.0010
42	at	5.39	2.6	0.0010
43	bt	5.52	2.7	0.0005
44	Ft	5.53	2.8	0.0005
45	at	5.53	2.8	0.0005
46	EWMA	5.73	1.9	0.0050
47	DEWMA	5.83	1.4	0.1000
48	DEWMA	7.64	2.1	0.0500
49	EWMA	7.89	2.1	0.0010
50	EWMA	9.26	1.8	0.0005
51	DEWMA	14.36	5.5	0.0100
52	DEWMA	19.62	11.4	0.0050
53	DEWMA	269.98	2.4	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-45

	Chart	ARL1	SD	Lambda
1	Ft	2.99	0.7	0.3000
2	EWMA	3.00	0.7	0.5000
3	at	3.00	0.7	0.3000
4	at	3.02	0.8	0.5000
5	Ft	3.09	0.7	0.2000
6	at	3.10	0.7	0.2000
7	EWMA	3.11	0.7	0.3000
8	bt	3.13	0.8	0.2000
9	bt	3.16	0.8	0.3000
10	DEWMA	3.20	0.7	0.5000
11	EWMA	3.23	0.7	0.2000
12	Shewhart	3.26	0.9	0.0050
13	Shewhart	3.26	0.9	0.3000
14	Shewhart	3.26	0.9	0.0010
15	Shewhart	3.27	0.9	0.0100
16	Shewhart	3.27	0.9	0.2000
17	Shewhart	3.28	0.9	0.5000
18	Shewhart	3.28	0.9	0.1000
19	Shewhart	3.28	0.9	0.0005
20	Shewhart	3.29	0.9	0.0500
21	bt	3.32	0.8	0.1000
22	Ft	3.37	0.8	0.1000
23	at	3.38	0.8	0.1000
24	EWMA	3.61	0.8	0.1000
25	bt	3.65	0.8	0.0500
26	Ft	3.76	0.9	0.0500
27	at	3.76	0.8	0.0500
28	DEWMA	3.78	0.8	0.3000
29	bt	3.91	1.4	0.5000
30	Ft	3.98	0.9	0.5000
31	EWMA	4.04	1.0	0.0500
32	DEWMA	4.42	0.9	0.2000
33	bt	4.50	1.3	0.0100
34	at	4.65	1.4	0.0100
35	Ft	4.65	1.4	0.0100
36	bt	4.87	1.6	0.0050
37	Ft	4.98	1.8	0.0050
38	at	5.00	1.8	0.0050
39	EWMA	5.12	1.6	0.0100
40	bt	5.31	2.5	0.0010
41	Ft	5.32	2.7	0.0010
42	at	5.36	2.6	0.0010
43	bt	5.51	2.8	0.0005
44	Ft	5.52	2.8	0.0005
45	at	5.52	2.8	0.0005
46	EWMA	5.72	1.9	0.0050
47	DEWMA	5.81	1.4	0.1000
48	DEWMA	7.68	2.1	0.0500
49	EWMA	7.86	2.1	0.0010
50	EWMA	9.25	1.9	0.0005
51	DEWMA	14.15	5.7	0.0100
52	DEWMA	19.99	14.0	0.0050
53	DEWMA	269.95	3.4	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-46

	Chart	ARL1	SD	Lambda
1	EWMA	2.91	0.7	0.5000
2	Ft	2.92	0.7	0.3000
3	at	2.93	0.7	0.5000
4	at	2.93	0.7	0.3000
5	Ft	3.00	0.7	0.2000
6	at	3.02	0.7	0.2000
7	EWMA	3.03	0.7	0.3000
8	bt	3.03	0.7	0.2000
9	bt	3.07	0.8	0.3000
10	DEWMA	3.11	0.7	0.5000
11	EWMA	3.14	0.7	0.2000
12	Shewhart	3.14	0.9	0.0100
13	Shewhart	3.15	0.9	0.0050
14	Shewhart	3.15	0.9	0.2000
15	Shewhart	3.16	0.9	0.0005
16	Shewhart	3.16	0.9	0.5000
17	Shewhart	3.16	0.9	0.1000
18	Shewhart	3.16	0.9	0.0500
19	Shewhart	3.17	0.9	0.0010
20	Shewhart	3.17	0.9	0.3000
21	bt	3.21	0.7	0.1000
22	Ft	3.29	0.7	0.1000
23	at	3.30	0.7	0.1000
24	EWMA	3.52	0.8	0.1000
25	bt	3.54	0.8	0.0500
26	Ft	3.64	0.9	0.0500
27	at	3.65	0.8	0.0500
28	bt	3.70	1.3	0.5000
29	DEWMA	3.70	0.8	0.3000
30	Ft	3.84	0.8	0.5000
31	EWMA	3.92	1.0	0.0500
32	DEWMA	4.32	0.9	0.2000
33	bt	4.40	1.3	0.0100
34	at	4.55	1.4	0.0100
35	Ft	4.55	1.4	0.0100
36	bt	4.76	1.5	0.0050
37	Ft	4.86	1.8	0.0050
38	at	4.87	1.8	0.0050
39	EWMA	5.00	1.6	0.0100
40	bt	5.24	2.5	0.0010
41	Ft	5.25	2.6	0.0010
42	at	5.28	2.6	0.0010
43	bt	5.37	2.6	0.0005
44	Ft	5.37	2.7	0.0005
45	at	5.38	2.7	0.0005
46	EWMA	5.58	1.9	0.0050
47	DEWMA	5.71	1.3	0.1000
48	DEWMA	7.52	2.1	0.0500
49	EWMA	7.70	2.0	0.0010
50	EWMA	9.02	1.7	0.0005
51	DEWMA	13.94	5.6	0.0100
52	DEWMA	19.40	11.8	0.0050
53	DEWMA	269.90	4.8	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-46

	Chart	ARL1	SD	Lambda
1	EWMA	2.91	0.7	0.5000
2	Ft	2.92	0.7	0.3000
3	at	2.92	0.7	0.5000
4	at	2.93	0.7	0.3000
5	Ft	3.00	0.7	0.2000
6	at	3.01	0.7	0.2000
7	bt	3.02	0.7	0.2000
8	EWMA	3.03	0.7	0.3000
9	bt	3.06	0.8	0.3000
10	DEWMA	3.11	0.7	0.5000
11	Shewhart	3.14	0.9	0.0005
12	EWMA	3.15	0.7	0.2000
13	Shewhart	3.15	0.9	0.0050
14	Shewhart	3.15	0.9	0.2000
15	Shewhart	3.16	0.9	0.0010
16	Shewhart	3.16	0.9	0.5000
17	Shewhart	3.16	0.9	0.1000
18	Shewhart	3.16	0.9	0.3000
19	Shewhart	3.17	0.9	0.0100
20	Shewhart	3.17	0.9	0.0500
21	bt	3.23	0.7	0.1000
22	Ft	3.30	0.7	0.1000
23	at	3.31	0.7	0.1000
24	bt	3.54	0.8	0.0500
25	EWMA	3.54	0.8	0.1000
26	Ft	3.64	0.9	0.0500
27	at	3.65	0.8	0.0500
28	bt	3.69	1.3	0.5000
29	DEWMA	3.70	0.8	0.3000
30	Ft	3.82	0.8	0.5000
31	EWMA	3.91	0.9	0.0500
32	DEWMA	4.34	0.9	0.2000
33	bt	4.41	1.3	0.0100
34	at	4.57	1.4	0.0100
35	Ft	4.57	1.4	0.0100
36	bt	4.78	1.5	0.0050
37	Ft	4.87	1.7	0.0050
38	at	4.89	1.7	0.0050
39	EWMA	5.03	1.5	0.0100
40	bt	5.22	2.4	0.0010
41	Ft	5.24	2.6	0.0010
42	at	5.27	2.5	0.0010
43	bt	5.30	2.7	0.0005
44	Ft	5.30	2.8	0.0005
45	at	5.31	2.8	0.0005
46	EWMA	5.58	1.9	0.0050
47	DEWMA	5.75	1.3	0.1000
48	DEWMA	7.49	2.1	0.0500
49	EWMA	7.69	2.0	0.0010
50	EWMA	8.96	1.8	0.0005
51	DEWMA	14.01	5.6	0.0100
52	DEWMA	19.32	11.8	0.0050
53	DEWMA	269.86	5.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-47

	Chart	ARL1	SD	Lambda
1	EWMA	2.82	0.7	0.5000
2	at	2.82	0.7	0.5000
3	Ft	2.83	0.7	0.3000
4	at	2.84	0.7	0.3000
5	Ft	2.92	0.7	0.2000
6	at	2.93	0.7	0.2000
7	EWMA	2.95	0.7	0.3000
8	bt	2.95	0.7	0.2000
9	bt	2.97	0.8	0.3000
10	DEWMA	3.02	0.7	0.5000
11	Shewhart	3.04	0.8	0.0050
12	Shewhart	3.04	0.8	0.5000
13	Shewhart	3.04	0.8	0.0005
14	Shewhart	3.05	0.8	0.0500
15	Shewhart	3.05	0.8	0.0100
16	Shewhart	3.05	0.8	0.2000
17	Shewhart	3.05	0.8	0.1000
18	Shewhart	3.05	0.8	0.0010
19	Shewhart	3.06	0.8	0.3000
20	EWMA	3.06	0.7	0.2000
21	bt	3.15	0.7	0.1000
22	Ft	3.21	0.7	0.1000
23	at	3.22	0.7	0.1000
24	bt	3.44	0.8	0.0500
25	EWMA	3.45	0.8	0.1000
26	bt	3.52	1.2	0.5000
27	Ft	3.55	0.8	0.0500
28	at	3.56	0.8	0.0500
29	DEWMA	3.62	0.8	0.3000
30	Ft	3.69	0.8	0.5000
31	EWMA	3.82	0.9	0.0500
32	DEWMA	4.23	0.9	0.2000
33	bt	4.32	1.2	0.0100
34	at	4.46	1.3	0.0100
35	Ft	4.47	1.4	0.0100
36	bt	4.67	1.5	0.0050
37	Ft	4.76	1.7	0.0050
38	at	4.77	1.7	0.0050
39	EWMA	4.89	1.5	0.0100
40	bt	5.12	2.4	0.0010
41	Ft	5.13	2.5	0.0010
42	at	5.16	2.5	0.0010
43	bt	5.31	2.6	0.0005
44	Ft	5.32	2.6	0.0005
45	at	5.33	2.6	0.0005
46	EWMA	5.47	1.8	0.0050
47	DEWMA	5.61	1.3	0.1000
48	DEWMA	7.36	2.0	0.0500
49	EWMA	7.51	2.0	0.0010
50	EWMA	8.85	1.8	0.0005
51	DEWMA	13.63	5.6	0.0100
52	DEWMA	18.89	9.0	0.0050
53	DEWMA	269.88	5.4	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-47

	Chart	ARL1	SD	Lambda
1	EWMA	2.83	0.7	0.5000
2	Ft	2.83	0.7	0.3000
3	at	2.84	0.7	0.5000
4	at	2.85	0.7	0.3000
5	Ft	2.92	0.7	0.2000
6	at	2.94	0.7	0.2000
7	bt	2.94	0.7	0.2000
8	EWMA	2.95	0.7	0.3000
9	bt	2.97	0.8	0.3000
10	DEWMA	3.03	0.7	0.5000
11	Shewhart	3.04	0.8	0.0010
12	Shewhart	3.04	0.8	0.2000
13	Shewhart	3.05	0.8	0.0500
14	Shewhart	3.05	0.8	0.3000
15	Shewhart	3.05	0.8	0.1000
16	Shewhart	3.06	0.8	0.0005
17	Shewhart	3.06	0.8	0.0050
18	Shewhart	3.07	0.8	0.0100
19	EWMA	3.07	0.7	0.2000
20	Shewhart	3.07	0.8	0.5000
21	bt	3.14	0.7	0.1000
22	Ft	3.20	0.7	0.1000
23	at	3.21	0.7	0.1000
24	EWMA	3.44	0.8	0.1000
25	bt	3.45	0.8	0.0500
26	bt	3.56	1.2	0.5000
27	Ft	3.57	0.8	0.0500
28	at	3.57	0.8	0.0500
29	DEWMA	3.63	0.8	0.3000
30	Ft	3.71	0.8	0.5000
31	EWMA	3.83	0.9	0.0500
32	DEWMA	4.25	0.9	0.2000
33	bt	4.31	1.2	0.0100
34	at	4.45	1.4	0.0100
35	Ft	4.46	1.4	0.0100
36	bt	4.65	1.5	0.0050
37	Ft	4.75	1.7	0.0050
38	at	4.76	1.7	0.0050
39	EWMA	4.90	1.5	0.0100
40	bt	5.12	2.4	0.0010
41	Ft	5.14	2.5	0.0010
42	at	5.18	2.5	0.0010
43	Ft	5.21	2.7	0.0005
44	bt	5.21	2.6	0.0005
45	at	5.22	2.6	0.0005
46	EWMA	5.45	1.9	0.0050
47	DEWMA	5.60	1.3	0.1000
48	DEWMA	7.41	2.0	0.0500
49	EWMA	7.53	2.0	0.0010
50	EWMA	8.78	1.8	0.0005
51	DEWMA	13.77	5.4	0.0100
52	DEWMA	18.87	9.4	0.0050
53	DEWMA	269.69	8.7	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-48

	Chart	ARL1	SD	Lambda
1	EWMA	2.75	0.7	0.5000
2	at	2.75	0.7	0.5000
3	Ft	2.76	0.7	0.3000
4	at	2.77	0.7	0.3000
5	Ft	2.84	0.7	0.2000
6	at	2.86	0.7	0.2000
7	bt	2.86	0.7	0.2000
8	EWMA	2.87	0.7	0.3000
9	bt	2.88	0.7	0.3000
10	Shewhart	2.94	0.8	0.0005
11	Shewhart	2.95	0.8	0.5000
12	Shewhart	2.95	0.8	0.2000
13	Shewhart	2.95	0.8	0.0050
14	Shewhart	2.95	0.8	0.0500
15	Shewhart	2.95	0.8	0.3000
16	Shewhart	2.95	0.8	0.0010
17	Shewhart	2.95	0.8	0.0100
18	DEWMA	2.96	0.7	0.5000
19	Shewhart	2.96	0.8	0.1000
20	EWMA	2.99	0.7	0.2000
21	bt	3.08	0.7	0.1000
22	Ft	3.14	0.7	0.1000
23	at	3.15	0.7	0.1000
24	EWMA	3.37	0.8	0.1000
25	bt	3.38	1.1	0.5000
26	bt	3.38	0.8	0.0500
27	Ft	3.49	0.8	0.0500
28	at	3.50	0.8	0.0500
29	DEWMA	3.55	0.7	0.3000
30	Ft	3.56	0.8	0.5000
31	EWMA	3.76	0.9	0.0500
32	DEWMA	4.16	0.9	0.2000
33	bt	4.20	1.2	0.0100
34	at	4.35	1.3	0.0100
35	Ft	4.36	1.3	0.0100
36	bt	4.58	1.4	0.0050
37	Ft	4.68	1.7	0.0050
38	at	4.70	1.7	0.0050
39	EWMA	4.79	1.5	0.0100
40	bt	5.04	2.3	0.0010
41	Ft	5.05	2.4	0.0010
42	bt	5.07	2.5	0.0005
43	Ft	5.08	2.6	0.0005
44	at	5.08	2.4	0.0010
45	at	5.08	2.6	0.0005
46	EWMA	5.37	1.8	0.0050
47	DEWMA	5.51	1.3	0.1000
48	DEWMA	7.31	2.0	0.0500
49	EWMA	7.39	1.9	0.0010
50	EWMA	8.58	1.7	0.0005
51	DEWMA	13.56	5.4	0.0100
52	DEWMA	18.52	6.9	0.0050
53	DEWMA	269.86	5.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-48

	Chart	ARL1	SD	Lambda
1	at	2.75	0.7	0.5000
2	EWMA	2.75	0.7	0.5000
3	Ft	2.77	0.7	0.3000
4	at	2.78	0.7	0.3000
5	Ft	2.85	0.7	0.2000
6	bt	2.86	0.7	0.2000
7	at	2.87	0.7	0.2000
8	EWMA	2.89	0.7	0.3000
9	bt	2.89	0.8	0.3000
10	Shewhart	2.93	0.8	0.0005
11	Shewhart	2.94	0.8	0.0100
12	Shewhart	2.94	0.8	0.1000
13	Shewhart	2.95	0.8	0.0010
14	Shewhart	2.95	0.8	0.2000
15	Shewhart	2.95	0.8	0.0500
16	Shewhart	2.95	0.8	0.5000
17	Shewhart	2.95	0.8	0.0050
18	Shewhart	2.96	0.8	0.3000
19	DEWMA	2.97	0.6	0.5000
20	EWMA	3.00	0.7	0.2000
21	bt	3.07	0.7	0.1000
22	Ft	3.13	0.7	0.1000
23	at	3.14	0.7	0.1000
24	EWMA	3.37	0.8	0.1000
25	bt	3.37	0.8	0.0500
26	bt	3.37	1.1	0.5000
27	Ft	3.48	0.8	0.0500
28	at	3.48	0.8	0.0500
29	DEWMA	3.56	0.7	0.3000
30	Ft	3.57	0.8	0.5000
31	EWMA	3.74	0.9	0.0500
32	DEWMA	4.18	0.9	0.2000
33	bt	4.19	1.2	0.0100
34	at	4.34	1.3	0.0100
35	Ft	4.34	1.3	0.0100
36	bt	4.56	1.5	0.0050
37	Ft	4.65	1.7	0.0050
38	at	4.67	1.7	0.0050
39	EWMA	4.77	1.5	0.0100
40	bt	5.00	2.4	0.0010
41	Ft	5.01	2.5	0.0010
42	at	5.04	2.5	0.0010
43	bt	5.12	2.5	0.0005
44	Ft	5.13	2.6	0.0005
45	at	5.13	2.6	0.0005
46	EWMA	5.34	1.8	0.0050
47	DEWMA	5.52	1.3	0.1000
48	DEWMA	7.26	2.0	0.0500
49	EWMA	7.36	1.9	0.0010
50	EWMA	8.61	1.7	0.0005
51	DEWMA	13.52	5.5	0.0100
52	DEWMA	18.57	7.3	0.0050
53	DEWMA	269.81	6.8	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-49

	Chart	ARL1	SD	Lambda
1	at	2.68	0.7	0.5000
2	EWMA	2.68	0.7	0.5000
3	Ft	2.69	0.7	0.3000
4	at	2.70	0.6	0.3000
5	Ft	2.79	0.6	0.2000
6	bt	2.79	0.7	0.3000
7	at	2.80	0.6	0.2000
8	bt	2.80	0.7	0.2000
9	EWMA	2.81	0.6	0.3000
10	Shewhart	2.86	0.8	0.0005
11	Shewhart	2.86	0.8	0.3000
12	Shewhart	2.86	0.8	0.5000
13	Shewhart	2.86	0.8	0.0100
14	Shewhart	2.86	0.8	0.1000
15	Shewhart	2.87	0.8	0.0050
16	Shewhart	2.87	0.8	0.2000
17	Shewhart	2.87	0.8	0.0010
18	Shewhart	2.87	0.8	0.0500
19	DEWMA	2.90	0.6	0.5000
20	EWMA	2.93	0.7	0.2000
21	bt	3.00	0.7	0.1000
22	Ft	3.07	0.7	0.1000
23	at	3.08	0.7	0.1000
24	bt	3.25	1.1	0.5000
25	EWMA	3.29	0.8	0.1000
26	bt	3.31	0.8	0.0500
27	Ft	3.41	0.8	0.0500
28	at	3.42	0.8	0.0500
29	Ft	3.46	0.7	0.5000
30	DEWMA	3.49	0.7	0.3000
31	EWMA	3.66	0.9	0.0500
32	DEWMA	4.09	0.9	0.2000
33	bt	4.12	1.2	0.0100
34	at	4.26	1.3	0.0100
35	Ft	4.27	1.3	0.0100
36	bt	4.46	1.4	0.0050
37	Ft	4.54	1.6	0.0050
38	at	4.56	1.6	0.0050
39	EWMA	4.68	1.5	0.0100
40	bt	4.88	2.3	0.0010
41	Ft	4.89	2.4	0.0010
42	at	4.92	2.4	0.0010
43	bt	5.02	2.5	0.0005
44	Ft	5.02	2.5	0.0005
45	at	5.03	2.5	0.0005
46	EWMA	5.21	1.7	0.0050
47	DEWMA	5.40	1.3	0.1000
48	DEWMA	7.13	2.0	0.0500
49	EWMA	7.19	1.9	0.0010
50	EWMA	8.43	1.7	0.0005
51	DEWMA	13.32	5.3	0.0100
52	DEWMA	18.15	6.4	0.0050
53	DEWMA	269.74	8.0	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-49

	Chart	ARL1	SD	Lambda
1	at	2.68	0.7	0.5000
2	EWMA	2.68	0.7	0.5000
3	Ft	2.69	0.6	0.3000
4	at	2.70	0.6	0.3000
5	Ft	2.79	0.6	0.2000
6	at	2.80	0.6	0.2000
7	bt	2.80	0.7	0.3000
8	bt	2.80	0.7	0.2000
9	EWMA	2.81	0.6	0.3000
10	Shewhart	2.85	0.8	0.2000
11	Shewhart	2.86	0.8	0.0010
12	Shewhart	2.86	0.8	0.0500
13	Shewhart	2.86	0.8	0.0050
14	Shewhart	2.86	0.8	0.5000
15	Shewhart	2.86	0.8	0.3000
16	Shewhart	2.87	0.8	0.0100
17	Shewhart	2.87	0.8	0.1000
18	Shewhart	2.87	0.8	0.0005
19	DEWMA	2.90	0.6	0.5000
20	EWMA	2.93	0.7	0.2000
21	bt	2.99	0.7	0.1000
22	Ft	3.06	0.7	0.1000
23	at	3.07	0.7	0.1000
24	bt	3.25	1.1	0.5000
25	EWMA	3.29	0.7	0.1000
26	bt	3.29	0.8	0.0500
27	Ft	3.40	0.8	0.0500
28	at	3.41	0.8	0.0500
29	Ft	3.46	0.7	0.5000
30	DEWMA	3.49	0.7	0.3000
31	EWMA	3.66	0.9	0.0500
32	DEWMA	4.10	0.9	0.2000
33	bt	4.14	1.2	0.0100
34	at	4.27	1.3	0.0100
35	Ft	4.28	1.3	0.0100
36	bt	4.47	1.4	0.0050
37	Ft	4.57	1.7	0.0050
38	at	4.58	1.7	0.0050
39	EWMA	4.70	1.5	0.0100
40	bt	4.88	2.3	0.0010
41	Ft	4.90	2.4	0.0010
42	at	4.93	2.4	0.0010
43	bt	4.99	2.5	0.0005
44	Ft	5.00	2.5	0.0005
45	at	5.00	2.5	0.0005
46	EWMA	5.24	1.8	0.0050
47	DEWMA	5.41	1.3	0.1000
48	DEWMA	7.15	2.0	0.0500
49	EWMA	7.19	1.9	0.0010
50	EWMA	8.43	1.6	0.0005
51	DEWMA	13.26	5.4	0.0100
52	DEWMA	18.25	7.4	0.0050
53	DEWMA	269.62	9.6	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-50

	Chart	ARL1	SD	Lambda
1	at	2.62	0.7	0.5000
2	EWMA	2.63	0.6	0.5000
3	Ft	2.63	0.6	0.3000
4	at	2.65	0.6	0.3000
5	Ft	2.72	0.6	0.2000
6	bt	2.73	0.6	0.2000
7	bt	2.73	0.7	0.3000
8	at	2.73	0.6	0.2000
9	EWMA	2.76	0.6	0.3000
10	Shewhart	2.77	0.8	0.0050
11	Shewhart	2.77	0.8	0.1000
12	Shewhart	2.77	0.8	0.0005
13	Shewhart	2.78	0.8	0.0500
14	Shewhart	2.78	0.8	0.2000
15	Shewhart	2.78	0.8	0.3000
16	Shewhart	2.78	0.8	0.5000
17	Shewhart	2.79	0.8	0.0100
18	Shewhart	2.79	0.8	0.0010
19	DEWMA	2.85	0.6	0.5000
20	EWMA	2.87	0.7	0.2000
21	bt	2.93	0.7	0.1000
22	Ft	3.00	0.7	0.1000
23	at	3.00	0.7	0.1000
24	bt	3.14	1.0	0.5000
25	EWMA	3.23	0.7	0.1000
26	bt	3.24	0.8	0.0500
27	Ft	3.34	0.8	0.0500
28	at	3.34	0.8	0.0500
29	Ft	3.35	0.7	0.5000
30	DEWMA	3.43	0.7	0.3000
31	EWMA	3.59	0.9	0.0500
32	DEWMA	4.02	0.9	0.2000
33	bt	4.04	1.1	0.0100
34	at	4.18	1.3	0.0100
35	Ft	4.18	1.3	0.0100
36	bt	4.37	1.4	0.0050
37	Ft	4.45	1.6	0.0050
38	at	4.46	1.6	0.0050
39	EWMA	4.59	1.4	0.0100
40	bt	4.79	2.3	0.0010
41	Ft	4.81	2.4	0.0010
42	at	4.84	2.4	0.0010
43	bt	4.93	2.4	0.0005
44	Ft	4.93	2.5	0.0005
45	at	4.94	2.5	0.0005
46	EWMA	5.11	1.7	0.0050
47	DEWMA	5.35	1.2	0.1000
48	DEWMA	7.03	2.0	0.0500
49	EWMA	7.05	1.9	0.0010
50	EWMA	8.28	1.6	0.0005
51	DEWMA	13.01	5.4	0.0100
52	DEWMA	17.95	6.7	0.0050
53	DEWMA	269.49	11.0	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-50

	Chart	ARL1	SD	Lambda
1	at	2.60	0.7	0.5000
2	EWMA	2.61	0.6	0.5000
3	Ft	2.62	0.6	0.3000
4	at	2.64	0.6	0.3000
5	bt	2.72	0.7	0.3000
6	Ft	2.72	0.6	0.2000
7	bt	2.72	0.6	0.2000
8	at	2.74	0.6	0.2000
9	EWMA	2.75	0.6	0.3000
10	Shewhart	2.76	0.8	0.1000
11	Shewhart	2.77	0.8	0.5000
12	Shewhart	2.77	0.8	0.3000
13	Shewhart	2.77	0.8	0.0500
14	Shewhart	2.77	0.8	0.0050
15	Shewhart	2.78	0.8	0.0010
16	Shewhart	2.78	0.8	0.2000
17	Shewhart	2.78	0.8	0.0005
18	Shewhart	2.78	0.8	0.0100
19	DEWMA	2.84	0.6	0.5000
20	EWMA	2.87	0.7	0.2000
21	bt	2.91	0.7	0.1000
22	Ft	2.99	0.7	0.1000
23	at	3.00	0.7	0.1000
24	bt	3.13	1.0	0.5000
25	EWMA	3.21	0.7	0.1000
26	bt	3.24	0.7	0.0500
27	Ft	3.34	0.7	0.5000
28	Ft	3.34	0.8	0.0500
29	at	3.35	0.8	0.0500
30	DEWMA	3.43	0.7	0.3000
31	EWMA	3.59	0.9	0.0500
32	DEWMA	4.04	0.9	0.2000
33	bt	4.04	1.1	0.0100
34	at	4.18	1.3	0.0100
35	Ft	4.18	1.3	0.0100
36	bt	4.36	1.4	0.0050
37	Ft	4.45	1.6	0.0050
38	at	4.47	1.6	0.0050
39	EWMA	4.60	1.4	0.0100
40	bt	4.81	2.2	0.0010
41	Ft	4.82	2.3	0.0010
42	at	4.85	2.3	0.0010
43	bt	4.90	2.4	0.0005
44	Ft	4.90	2.5	0.0005
45	at	4.91	2.5	0.0005
46	EWMA	5.10	1.7	0.0050
47	DEWMA	5.33	1.2	0.1000
48	DEWMA	7.03	2.0	0.0500
49	EWMA	7.06	1.9	0.0010
50	EWMA	8.25	1.6	0.0005
51	DEWMA	13.11	5.3	0.0100
52	DEWMA	17.84	6.4	0.0050
53	DEWMA	269.64	9.3	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-51

	Chart	ARL1	SD	Lambda
1	at	2.54	0.6	0.5000
2	EWMA	2.55	0.6	0.5000
3	Ft	2.57	0.6	0.3000
4	at	2.59	0.6	0.3000
5	bt	2.65	0.7	0.3000
6	Ft	2.67	0.6	0.2000
7	bt	2.68	0.6	0.2000
8	at	2.68	0.6	0.2000
9	Shewhart	2.68	0.7	0.0005
10	Shewhart	2.69	0.7	0.0500
11	Shewhart	2.69	0.7	0.0010
12	Shewhart	2.69	0.7	0.5000
13	EWMA	2.70	0.6	0.3000
14	Shewhart	2.70	0.7	0.2000
15	Shewhart	2.70	0.7	0.3000
16	Shewhart	2.70	0.7	0.0050
17	Shewhart	2.71	0.7	0.1000
18	Shewhart	2.71	0.7	0.0100
19	DEWMA	2.79	0.6	0.5000
20	EWMA	2.80	0.6	0.2000
21	bt	2.87	0.6	0.1000
22	Ft	2.93	0.7	0.1000
23	at	2.94	0.7	0.1000
24	bt	3.01	1.0	0.5000
25	EWMA	3.16	0.7	0.1000
26	bt	3.17	0.7	0.0500
27	Ft	3.25	0.7	0.5000
28	at	3.27	0.8	0.0500
29	Ft	3.27	0.8	0.0500
30	DEWMA	3.37	0.7	0.3000
31	EWMA	3.50	0.9	0.0500
32	DEWMA	3.94	0.8	0.2000
33	bt	3.98	1.1	0.0100
34	at	4.12	1.2	0.0100
35	Ft	4.12	1.2	0.0100
36	bt	4.33	1.4	0.0050
37	Ft	4.42	1.6	0.0050
38	at	4.44	1.6	0.0050
39	EWMA	4.53	1.4	0.0100
40	bt	4.71	2.2	0.0010
41	Ft	4.73	2.3	0.0010
42	at	4.75	2.3	0.0010
43	bt	4.78	2.4	0.0005
44	Ft	4.79	2.5	0.0005
45	at	4.79	2.5	0.0005
46	EWMA	5.07	1.7	0.0050
47	DEWMA	5.24	1.2	0.1000
48	DEWMA	6.90	1.9	0.0500
49	EWMA	6.92	1.8	0.0010
50	EWMA	8.08	1.6	0.0005
51	DEWMA	12.99	5.1	0.0100
52	DEWMA	17.83	6.6	0.0050
53	DEWMA	269.37	12.2	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-51

	Chart	ARL1	SD	Lambda
1	at	2.54	0.6	0.5000
2	Ft	2.55	0.6	0.3000
3	EWMA	2.56	0.6	0.5000
4	at	2.57	0.6	0.3000
5	bt	2.64	0.7	0.3000
6	Ft	2.67	0.6	0.2000
7	bt	2.68	0.6	0.2000
8	Shewhart	2.68	0.7	0.5000
9	Shewhart	2.68	0.7	0.3000
10	EWMA	2.69	0.6	0.3000
11	Shewhart	2.69	0.8	0.0050
12	at	2.69	0.6	0.2000
13	Shewhart	2.69	0.7	0.0500
14	Shewhart	2.69	0.7	0.0100
15	Shewhart	2.69	0.7	0.1000
16	Shewhart	2.70	0.7	0.2000
17	Shewhart	2.70	0.7	0.0005
18	Shewhart	2.71	0.7	0.0010
19	DEWMA	2.79	0.6	0.5000
20	EWMA	2.82	0.6	0.2000
21	bt	2.87	0.6	0.1000
22	Ft	2.94	0.7	0.1000
23	at	2.95	0.7	0.1000
24	bt	3.02	1.0	0.5000
25	bt	3.17	0.7	0.0500
26	EWMA	3.18	0.7	0.1000
27	Ft	3.25	0.7	0.5000
28	Ft	3.28	0.8	0.0500
29	at	3.28	0.8	0.0500
30	DEWMA	3.36	0.7	0.3000
31	EWMA	3.52	0.9	0.0500
32	bt	3.95	1.1	0.0100
33	DEWMA	3.96	0.8	0.2000
34	at	4.09	1.2	0.0100
35	Ft	4.10	1.3	0.0100
36	bt	4.28	1.4	0.0050
37	Ft	4.37	1.6	0.0050
38	at	4.39	1.6	0.0050
39	EWMA	4.50	1.4	0.0100
40	bt	4.70	2.2	0.0010
41	Ft	4.70	2.3	0.0010
42	at	4.73	2.3	0.0010
43	bt	4.84	2.4	0.0005
44	Ft	4.86	2.5	0.0005
45	at	4.86	2.4	0.0005
46	EWMA	5.03	1.7	0.0050
47	DEWMA	5.27	1.2	0.1000
48	EWMA	6.91	1.8	0.0010
49	DEWMA	6.94	1.9	0.0500
50	EWMA	8.12	1.6	0.0005
51	DEWMA	12.96	5.2	0.0100
52	DEWMA	17.71	6.2	0.0050
53	DEWMA	269.42	11.8	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-52

	Chart	ARL1	SD	Lambda
1	at	2.42	0.6	0.5000
2	EWMA	2.44	0.6	0.5000
3	Ft	2.45	0.6	0.3000
4	at	2.47	0.6	0.3000
5	bt	2.53	0.6	0.3000
6	Shewhart	2.55	0.7	0.3000
7	Shewhart	2.55	0.7	0.5000
8	Shewhart	2.55	0.7	0.2000
9	Shewhart	2.55	0.7	0.0010
10	Shewhart	2.55	0.7	0.0050
11	Shewhart	2.56	0.7	0.0500
12	Shewhart	2.56	0.7	0.0100
13	Shewhart	2.56	0.7	0.0005
14	Shewhart	2.56	0.7	0.1000
15	bt	2.56	0.6	0.2000
16	Ft	2.56	0.6	0.2000
17	at	2.58	0.6	0.2000
18	EWMA	2.58	0.6	0.3000
19	DEWMA	2.68	0.6	0.5000
20	EWMA	2.70	0.6	0.2000
21	bt	2.75	0.6	0.1000
22	bt	2.82	0.9	0.5000
23	Ft	2.82	0.6	0.1000
24	at	2.83	0.6	0.1000
25	EWMA	3.03	0.7	0.1000
26	bt	3.06	0.7	0.0500
27	Ft	3.07	0.7	0.5000
28	Ft	3.16	0.7	0.0500
29	at	3.16	0.7	0.0500
30	DEWMA	3.25	0.7	0.3000
31	EWMA	3.39	0.8	0.0500
32	bt	3.80	1.1	0.0100
33	DEWMA	3.84	0.8	0.2000
34	at	3.94	1.2	0.0100
35	Ft	3.94	1.2	0.0100
36	bt	4.15	1.3	0.0050
37	Ft	4.24	1.5	0.0050
38	at	4.25	1.5	0.0050
39	EWMA	4.33	1.3	0.0100
40	bt	4.51	2.1	0.0010
41	Ft	4.52	2.2	0.0010
42	at	4.54	2.2	0.0010
43	bt	4.62	2.3	0.0005
44	Ft	4.62	2.4	0.0005
45	at	4.63	2.4	0.0005
46	EWMA	4.86	1.6	0.0050
47	DEWMA	5.09	1.2	0.1000
48	EWMA	6.64	1.7	0.0010
49	DEWMA	6.76	1.8	0.0500
50	EWMA	7.79	1.6	0.0005
51	DEWMA	12.59	5.0	0.0100
52	DEWMA	17.27	6.0	0.0050
53	DEWMA	268.94	15.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-52

	Chart	ARL1	SD	Lambda
1	at	2.42	0.6	0.5000
2	EWMA	2.44	0.6	0.5000
3	Ft	2.44	0.6	0.3000
4	at	2.46	0.6	0.3000
5	bt	2.52	0.6	0.3000
6	Shewhart	2.54	0.7	0.3000
7	Shewhart	2.54	0.7	0.0010
8	Shewhart	2.55	0.7	0.2000
9	Shewhart	2.55	0.7	0.0050
10	Shewhart	2.55	0.7	0.0500
11	Ft	2.55	0.6	0.2000
12	Shewhart	2.55	0.7	0.5000
13	Shewhart	2.55	0.7	0.0005
14	bt	2.56	0.6	0.2000
15	Shewhart	2.56	0.7	0.1000
16	Shewhart	2.56	0.7	0.0100
17	at	2.57	0.6	0.2000
18	EWMA	2.58	0.6	0.3000
19	DEWMA	2.69	0.6	0.5000
20	EWMA	2.70	0.6	0.2000
21	bt	2.77	0.6	0.1000
22	bt	2.82	0.9	0.5000
23	Ft	2.83	0.6	0.1000
24	at	2.84	0.6	0.1000
25	bt	3.04	0.7	0.0500
26	EWMA	3.06	0.7	0.1000
27	Ft	3.07	0.7	0.5000
28	Ft	3.14	0.7	0.0500
29	at	3.15	0.7	0.0500
30	DEWMA	3.24	0.7	0.3000
31	EWMA	3.38	0.8	0.0500
32	bt	3.82	1.1	0.0100
33	DEWMA	3.84	0.8	0.2000
34	at	3.94	1.2	0.0100
35	Ft	3.95	1.2	0.0100
36	bt	4.13	1.3	0.0050
37	Ft	4.22	1.5	0.0050
38	at	4.23	1.5	0.0050
39	EWMA	4.34	1.3	0.0100
40	bt	4.52	2.1	0.0010
41	Ft	4.53	2.2	0.0010
42	at	4.56	2.2	0.0010
43	bt	4.63	2.3	0.0005
44	Ft	4.64	2.4	0.0005
45	at	4.64	2.4	0.0005
46	EWMA	4.84	1.6	0.0050
47	DEWMA	5.12	1.2	0.1000
48	EWMA	6.67	1.7	0.0010
49	DEWMA	6.74	1.9	0.0500
50	EWMA	7.80	1.6	0.0005
51	DEWMA	12.53	5.1	0.0100
52	DEWMA	17.19	6.1	0.0050
53	DEWMA	268.97	15.7	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-53

	Chart	ARL1	SD	Lambda
1	at	2.33	0.6	0.5000
2	Ft	2.36	0.6	0.3000
3	EWMA	2.36	0.6	0.5000
4	at	2.38	0.6	0.3000
5	Shewhart	2.42	0.7	0.0500
6	bt	2.42	0.6	0.3000
7	Shewhart	2.43	0.7	0.0005
8	Shewhart	2.43	0.7	0.2000
9	Shewhart	2.43	0.7	0.0100
10	Shewhart	2.43	0.7	0.0050
11	Shewhart	2.43	0.7	0.0010
12	Shewhart	2.43	0.7	0.3000
13	Shewhart	2.44	0.7	0.5000
14	Shewhart	2.44	0.7	0.1000
15	Ft	2.47	0.6	0.2000
16	bt	2.47	0.6	0.2000
17	at	2.48	0.6	0.2000
18	EWMA	2.49	0.6	0.3000
19	DEWMA	2.61	0.6	0.5000
20	EWMA	2.61	0.6	0.2000
21	bt	2.66	0.8	0.5000
22	bt	2.67	0.6	0.1000
23	Ft	2.73	0.6	0.1000
24	at	2.74	0.6	0.1000
25	Ft	2.92	0.6	0.5000
26	EWMA	2.93	0.7	0.1000
27	bt	2.94	0.7	0.0500
28	Ft	3.04	0.7	0.0500
29	at	3.04	0.7	0.0500
30	DEWMA	3.16	0.7	0.3000
31	EWMA	3.27	0.8	0.0500
32	bt	3.71	1.0	0.0100
33	DEWMA	3.72	0.8	0.2000
34	at	3.84	1.1	0.0100
35	Ft	3.85	1.2	0.0100
36	bt	3.98	1.3	0.0050
37	Ft	4.06	1.5	0.0050
38	at	4.07	1.5	0.0050
39	EWMA	4.21	1.3	0.0100
40	bt	4.34	2.1	0.0010
41	Ft	4.36	2.2	0.0010
42	at	4.38	2.2	0.0010
43	bt	4.47	2.2	0.0005
44	Ft	4.47	2.3	0.0005
45	at	4.47	2.3	0.0005
46	EWMA	4.67	1.6	0.0050
47	DEWMA	4.95	1.1	0.1000
48	EWMA	6.42	1.7	0.0010
49	DEWMA	6.56	1.8	0.0500
50	EWMA	7.53	1.5	0.0005
51	DEWMA	12.32	5.0	0.0100
52	DEWMA	16.84	5.9	0.0050
53	DEWMA	268.03	21.7	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-53

	Chart	ARL1	SD	Lambda
1	at	2.31	0.6	0.5000
2	EWMA	2.34	0.6	0.5000
3	Ft	2.35	0.6	0.3000
4	at	2.36	0.6	0.3000
5	bt	2.41	0.6	0.3000
6	Shewhart	2.42	0.7	0.0050
7	Shewhart	2.42	0.7	0.0500
8	Shewhart	2.42	0.7	0.5000
9	Shewhart	2.42	0.7	0.0100
10	Shewhart	2.43	0.7	0.1000
11	Shewhart	2.43	0.7	0.3000
12	Shewhart	2.43	0.7	0.0010
13	Shewhart	2.43	0.7	0.2000
14	Shewhart	2.44	0.7	0.0005
15	bt	2.46	0.6	0.2000
16	Ft	2.47	0.6	0.2000
17	EWMA	2.49	0.6	0.3000
18	at	2.49	0.6	0.2000
19	DEWMA	2.60	0.6	0.5000
20	EWMA	2.61	0.6	0.2000
21	bt	2.64	0.8	0.5000
22	bt	2.66	0.6	0.1000
23	Ft	2.73	0.6	0.1000
24	at	2.74	0.6	0.1000
25	Ft	2.91	0.6	0.5000
26	bt	2.93	0.7	0.0500
27	EWMA	2.94	0.7	0.1000
28	Ft	3.03	0.7	0.0500
29	at	3.03	0.7	0.0500
30	DEWMA	3.14	0.7	0.3000
31	EWMA	3.27	0.8	0.0500
32	bt	3.68	1.1	0.0100
33	DEWMA	3.72	0.8	0.2000
34	at	3.81	1.2	0.0100
35	Ft	3.81	1.2	0.0100
36	bt	3.99	1.3	0.0050
37	Ft	4.07	1.5	0.0050
38	at	4.09	1.5	0.0050
39	EWMA	4.18	1.3	0.0100
40	bt	4.37	2.1	0.0010
41	Ft	4.38	2.1	0.0010
42	at	4.40	2.1	0.0010
43	bt	4.49	2.2	0.0005
44	Ft	4.50	2.3	0.0005
45	at	4.50	2.3	0.0005
46	EWMA	4.67	1.6	0.0050
47	DEWMA	4.98	1.2	0.1000
48	EWMA	6.42	1.7	0.0010
49	DEWMA	6.57	1.8	0.0500
50	EWMA	7.54	1.5	0.0005
51	DEWMA	12.26	5.0	0.0100
52	DEWMA	16.83	5.9	0.0050
53	DEWMA	268.17	20.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-54

	Chart	ARL1	SD	Lambda
1	at	2.21	0.6	0.5000
2	EWMA	2.25	0.6	0.5000
3	Ft	2.26	0.6	0.3000
4	at	2.28	0.6	0.3000
5	Shewhart	2.31	0.7	0.3000
6	Shewhart	2.31	0.6	0.0010
7	Shewhart	2.31	0.7	0.5000
8	bt	2.31	0.6	0.3000
9	Shewhart	2.32	0.6	0.0100
10	Shewhart	2.32	0.7	0.2000
11	Shewhart	2.32	0.6	0.0050
12	Shewhart	2.32	0.6	0.1000
13	Shewhart	2.32	0.6	0.0500
14	Shewhart	2.32	0.7	0.0005
15	bt	2.36	0.6	0.2000
16	Ft	2.38	0.6	0.2000
17	at	2.39	0.6	0.2000
18	EWMA	2.39	0.6	0.3000
19	bt	2.50	0.8	0.5000
20	DEWMA	2.51	0.6	0.5000
21	EWMA	2.52	0.6	0.2000
22	bt	2.57	0.6	0.1000
23	Ft	2.64	0.6	0.1000
24	at	2.64	0.6	0.1000
25	Ft	2.79	0.6	0.5000
26	EWMA	2.83	0.7	0.1000
27	bt	2.85	0.7	0.0500
28	Ft	2.94	0.7	0.0500
29	at	2.95	0.7	0.0500
30	DEWMA	3.05	0.7	0.3000
31	EWMA	3.16	0.8	0.0500
32	bt	3.58	1.0	0.0100
33	DEWMA	3.62	0.8	0.2000
34	at	3.69	1.1	0.0100
35	Ft	3.70	1.1	0.0100
36	bt	3.88	1.2	0.0050
37	Ft	3.95	1.4	0.0050
38	at	3.97	1.4	0.0050
39	EWMA	4.07	1.2	0.0100
40	bt	4.24	2.0	0.0010
41	Ft	4.24	2.1	0.0010
42	at	4.27	2.1	0.0010
43	bt	4.34	2.1	0.0005
44	Ft	4.35	2.2	0.0005
45	at	4.35	2.2	0.0005
46	EWMA	4.53	1.5	0.0050
47	DEWMA	4.85	1.1	0.1000
48	EWMA	6.23	1.6	0.0010
49	DEWMA	6.40	1.8	0.0500
50	EWMA	7.30	1.4	0.0005
51	DEWMA	12.03	4.8	0.0100
52	DEWMA	16.45	5.7	0.0050
53	DEWMA	266.44	29.1	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-54

	Chart	ARL1	SD	Lambda
1	at	2.21	0.6	0.5000
2	EWMA	2.24	0.6	0.5000
3	Ft	2.26	0.6	0.3000
4	at	2.27	0.6	0.3000
5	Shewhart	2.31	0.6	0.0005
6	Shewhart	2.31	0.6	0.0050
7	Shewhart	2.31	0.7	0.5000
8	Shewhart	2.31	0.7	0.3000
9	Shewhart	2.31	0.6	0.0100
10	Shewhart	2.31	0.6	0.0010
11	bt	2.31	0.6	0.3000
12	Shewhart	2.32	0.6	0.1000
13	Shewhart	2.32	0.6	0.2000
14	Shewhart	2.33	0.6	0.0500
15	bt	2.36	0.6	0.2000
16	Ft	2.38	0.6	0.2000
17	at	2.39	0.6	0.2000
18	EWMA	2.40	0.6	0.3000
19	DEWMA	2.51	0.6	0.5000
20	bt	2.52	0.8	0.5000
21	EWMA	2.52	0.6	0.2000
22	bt	2.57	0.6	0.1000
23	Ft	2.64	0.6	0.1000
24	at	2.65	0.6	0.1000
25	Ft	2.78	0.6	0.5000
26	EWMA	2.84	0.7	0.1000
27	bt	2.86	0.7	0.0500
28	Ft	2.95	0.7	0.0500
29	at	2.96	0.7	0.0500
30	DEWMA	3.06	0.7	0.3000
31	EWMA	3.17	0.8	0.0500
32	bt	3.58	1.0	0.0100
33	DEWMA	3.63	0.8	0.2000
34	at	3.70	1.1	0.0100
35	Ft	3.70	1.1	0.0100
36	bt	3.87	1.2	0.0050
37	Ft	3.95	1.4	0.0050
38	at	3.97	1.4	0.0050
39	EWMA	4.06	1.3	0.0100
40	bt	4.25	2.0	0.0010
41	Ft	4.26	2.1	0.0010
42	at	4.28	2.1	0.0010
43	bt	4.33	2.2	0.0005
44	Ft	4.33	2.2	0.0005
45	at	4.34	2.2	0.0005
46	EWMA	4.54	1.5	0.0050
47	DEWMA	4.85	1.1	0.1000
48	EWMA	6.23	1.7	0.0010
49	DEWMA	6.41	1.7	0.0500
50	EWMA	7.29	1.5	0.0005
51	DEWMA	11.99	4.8	0.0100
52	DEWMA	16.50	5.8	0.0050
53	DEWMA	266.63	28.3	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-55

	Chart	ARL1	SD	Lambda
1	at	2.13	0.5	0.5000
2	EWMA	2.17	0.5	0.5000
3	Ft	2.19	0.5	0.3000
4	at	2.20	0.5	0.3000
5	Shewhart	2.21	0.6	0.5000
6	Shewhart	2.21	0.6	0.0050
7	Shewhart	2.22	0.6	0.2000
8	Shewhart	2.22	0.6	0.0010
9	Shewhart	2.22	0.6	0.0005
10	Shewhart	2.22	0.6	0.0500
11	Shewhart	2.22	0.6	0.1000
12	Shewhart	2.22	0.6	0.0100
13	Shewhart	2.23	0.6	0.3000
14	bt	2.23	0.6	0.3000
15	bt	2.28	0.6	0.2000
16	Ft	2.30	0.6	0.2000
17	at	2.31	0.6	0.2000
18	EWMA	2.32	0.6	0.3000
19	bt	2.39	0.7	0.5000
20	DEWMA	2.44	0.6	0.5000
21	EWMA	2.44	0.6	0.2000
22	bt	2.49	0.6	0.1000
23	Ft	2.56	0.6	0.1000
24	at	2.57	0.6	0.1000
25	Ft	2.67	0.6	0.5000
26	EWMA	2.75	0.6	0.1000
27	bt	2.76	0.6	0.0500
28	Ft	2.86	0.7	0.0500
29	at	2.86	0.7	0.0500
30	DEWMA	2.98	0.6	0.3000
31	EWMA	3.08	0.8	0.0500
32	bt	3.47	1.0	0.0100
33	DEWMA	3.53	0.8	0.2000
34	at	3.59	1.1	0.0100
35	Ft	3.59	1.1	0.0100
36	bt	3.75	1.2	0.0050
37	Ft	3.83	1.4	0.0050
38	at	3.84	1.4	0.0050
39	EWMA	3.95	1.2	0.0100
40	bt	4.13	1.9	0.0010
41	Ft	4.13	2.0	0.0010
42	at	4.16	2.0	0.0010
43	bt	4.19	2.1	0.0005
44	Ft	4.20	2.2	0.0005
45	at	4.20	2.2	0.0005
46	EWMA	4.39	1.5	0.0050
47	DEWMA	4.73	1.1	0.1000
48	EWMA	6.07	1.6	0.0010
49	DEWMA	6.28	1.7	0.0500
50	EWMA	7.07	1.4	0.0005
51	DEWMA	11.77	4.7	0.0100
52	DEWMA	16.14	5.6	0.0050
53	DEWMA	264.94	34.5	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-55

	Chart	ARL1	SD	Lambda
1	at	2.14	0.5	0.5000
2	EWMA	2.18	0.5	0.5000
3	Ft	2.18	0.5	0.3000
4	at	2.19	0.5	0.3000
5	Shewhart	2.20	0.6	0.1000
6	Shewhart	2.21	0.6	0.0050
7	Shewhart	2.21	0.6	0.0005
8	Shewhart	2.22	0.6	0.0010
9	Shewhart	2.22	0.6	0.0500
10	Shewhart	2.22	0.6	0.2000
11	Shewhart	2.22	0.6	0.5000
12	Shewhart	2.22	0.6	0.0100
13	Shewhart	2.22	0.6	0.3000
14	bt	2.22	0.6	0.3000
15	bt	2.28	0.6	0.2000
16	Ft	2.29	0.6	0.2000
17	at	2.31	0.6	0.2000
18	EWMA	2.32	0.6	0.3000
19	bt	2.39	0.7	0.5000
20	EWMA	2.44	0.6	0.2000
21	DEWMA	2.44	0.6	0.5000
22	bt	2.49	0.6	0.1000
23	Ft	2.56	0.6	0.1000
24	at	2.57	0.6	0.1000
25	Ft	2.67	0.6	0.5000
26	EWMA	2.76	0.6	0.1000
27	bt	2.76	0.6	0.0500
28	Ft	2.84	0.7	0.0500
29	at	2.84	0.7	0.0500
30	DEWMA	2.97	0.6	0.3000
31	EWMA	3.06	0.8	0.0500
32	bt	3.47	1.0	0.0100
33	DEWMA	3.53	0.7	0.2000
34	at	3.58	1.1	0.0100
35	Ft	3.58	1.1	0.0100
36	bt	3.76	1.2	0.0050
37	Ft	3.84	1.4	0.0050
38	at	3.85	1.4	0.0050
39	EWMA	3.93	1.2	0.0100
40	bt	4.12	1.9	0.0010
41	Ft	4.13	2.0	0.0010
42	at	4.15	2.0	0.0010
43	bt	4.20	2.1	0.0005
44	Ft	4.21	2.2	0.0005
45	at	4.21	2.2	0.0005
46	EWMA	4.41	1.5	0.0050
47	DEWMA	4.72	1.1	0.1000
48	EWMA	6.06	1.6	0.0010
49	DEWMA	6.23	1.7	0.0500
50	EWMA	7.08	1.4	0.0005
51	DEWMA	11.75	4.7	0.0100
52	DEWMA	16.14	5.6	0.0050
53	DEWMA	264.85	34.8	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-56

	Chart	ARL1	SD	Lambda
1	at	2.06	0.5	0.5000
2	EWMA	2.09	0.5	0.5000
3	Ft	2.12	0.5	0.3000
4	Shewhart	2.12	0.6	0.1000
5	Shewhart	2.12	0.6	0.0050
6	Shewhart	2.12	0.6	0.5000
7	Shewhart	2.12	0.6	0.2000
8	Shewhart	2.13	0.6	0.0010
9	Shewhart	2.13	0.6	0.0005
10	Shewhart	2.13	0.6	0.0500
11	at	2.13	0.5	0.3000
12	Shewhart	2.13	0.6	0.0100
13	Shewhart	2.14	0.6	0.3000
14	bt	2.16	0.5	0.3000
15	bt	2.20	0.5	0.2000
16	Ft	2.22	0.5	0.2000
17	at	2.23	0.5	0.2000
18	EWMA	2.25	0.5	0.3000
19	bt	2.28	0.7	0.5000
20	DEWMA	2.36	0.6	0.5000
21	EWMA	2.37	0.6	0.2000
22	bt	2.41	0.6	0.1000
23	Ft	2.48	0.6	0.1000
24	at	2.49	0.6	0.1000
25	Ft	2.55	0.6	0.5000
26	EWMA	2.67	0.6	0.1000
27	bt	2.68	0.6	0.0500
28	Ft	2.77	0.7	0.0500
29	at	2.77	0.7	0.0500
30	DEWMA	2.90	0.6	0.3000
31	EWMA	2.98	0.7	0.0500
32	bt	3.39	1.0	0.0100
33	DEWMA	3.45	0.7	0.2000
34	at	3.51	1.0	0.0100
35	Ft	3.52	1.0	0.0100
36	bt	3.65	1.2	0.0050
37	Ft	3.73	1.4	0.0050
38	at	3.74	1.3	0.0050
39	EWMA	3.87	1.2	0.0100
40	bt	4.00	1.9	0.0010
41	Ft	4.01	2.0	0.0010
42	at	4.04	2.0	0.0010
43	bt	4.10	2.0	0.0005
44	Ft	4.11	2.1	0.0005
45	at	4.11	2.1	0.0005
46	EWMA	4.28	1.4	0.0050
47	DEWMA	4.61	1.1	0.1000
48	EWMA	5.89	1.5	0.0010
49	DEWMA	6.14	1.7	0.0500
50	EWMA	6.89	1.4	0.0005
51	DEWMA	11.65	4.6	0.0100
52	DEWMA	15.83	5.5	0.0050
53	DEWMA	261.48	44.5	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-56

	Chart	ARL1	SD	Lambda
1	at	2.07	0.5	0.5000
2	EWMA	2.10	0.5	0.5000
3	Ft	2.11	0.5	0.3000
4	Shewhart	2.12	0.6	0.0500
5	Shewhart	2.12	0.6	0.0005
6	at	2.13	0.5	0.3000
7	Shewhart	2.13	0.6	0.0010
8	Shewhart	2.13	0.6	0.1000
9	Shewhart	2.13	0.6	0.2000
10	Shewhart	2.13	0.6	0.0050
11	Shewhart	2.14	0.6	0.5000
12	Shewhart	2.14	0.6	0.3000
13	Shewhart	2.14	0.6	0.0100
14	bt	2.16	0.5	0.3000
15	bt	2.21	0.5	0.2000
16	Ft	2.22	0.5	0.2000
17	at	2.24	0.5	0.2000
18	EWMA	2.24	0.5	0.3000
19	bt	2.29	0.7	0.5000
20	EWMA	2.37	0.6	0.2000
21	DEWMA	2.37	0.6	0.5000
22	bt	2.42	0.6	0.1000
23	Ft	2.49	0.6	0.1000
24	at	2.50	0.6	0.1000
25	Ft	2.56	0.6	0.5000
26	EWMA	2.68	0.6	0.1000
27	bt	2.68	0.6	0.0500
28	Ft	2.77	0.6	0.0500
29	at	2.77	0.6	0.0500
30	DEWMA	2.89	0.6	0.3000
31	EWMA	2.99	0.7	0.0500
32	bt	3.37	1.0	0.0100
33	DEWMA	3.45	0.7	0.2000
34	at	3.50	1.0	0.0100
35	Ft	3.50	1.1	0.0100
36	bt	3.65	1.2	0.0050
37	Ft	3.72	1.3	0.0050
38	at	3.73	1.3	0.0050
39	EWMA	3.83	1.2	0.0100
40	bt	4.00	1.9	0.0010
41	Ft	4.01	2.0	0.0010
42	at	4.03	2.0	0.0010
43	bt	4.05	2.0	0.0005
44	Ft	4.06	2.1	0.0005
45	at	4.07	2.1	0.0005
46	EWMA	4.28	1.4	0.0050
47	DEWMA	4.62	1.1	0.1000
48	EWMA	5.87	1.6	0.0010
49	DEWMA	6.13	1.7	0.0500
50	EWMA	6.86	1.4	0.0005
51	DEWMA	11.52	4.7	0.0100
52	DEWMA	15.80	5.5	0.0050
53	DEWMA	261.81	43.6	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-57

	Chart	ARL1	SD	Lambda
1	at	2.00	0.5	0.5000
2	Ft	2.03	0.5	0.3000
3	Shewhart	2.04	0.6	0.0010
4	Shewhart	2.04	0.6	0.1000
5	EWMA	2.04	0.5	0.5000
6	Shewhart	2.04	0.6	0.3000
7	Shewhart	2.05	0.6	0.2000
8	Shewhart	2.05	0.6	0.0500
9	at	2.05	0.5	0.3000
10	Shewhart	2.05	0.6	0.0050
11	Shewhart	2.05	0.6	0.0005
12	Shewhart	2.05	0.6	0.5000
13	Shewhart	2.05	0.6	0.0100
14	bt	2.07	0.5	0.3000
15	bt	2.14	0.5	0.2000
16	Ft	2.15	0.5	0.2000
17	EWMA	2.16	0.5	0.3000
18	at	2.16	0.5	0.2000
19	bt	2.19	0.6	0.5000
20	EWMA	2.29	0.6	0.2000
21	DEWMA	2.29	0.5	0.5000
22	bt	2.34	0.6	0.1000
23	Ft	2.40	0.6	0.1000
24	at	2.41	0.6	0.1000
25	Ft	2.46	0.5	0.5000
26	EWMA	2.60	0.6	0.1000
27	bt	2.61	0.6	0.0500
28	Ft	2.70	0.6	0.0500
29	at	2.71	0.6	0.0500
30	DEWMA	2.82	0.6	0.3000
31	EWMA	2.91	0.7	0.0500
32	bt	3.29	0.9	0.0100
33	DEWMA	3.38	0.7	0.2000
34	at	3.39	1.0	0.0100
35	Ft	3.40	1.0	0.0100
36	bt	3.56	1.1	0.0050
37	Ft	3.64	1.3	0.0050
38	at	3.65	1.3	0.0050
39	EWMA	3.74	1.2	0.0100
40	bt	3.90	1.8	0.0010
41	Ft	3.91	1.9	0.0010
42	at	3.94	1.9	0.0010
43	bt	3.98	2.0	0.0005
44	Ft	3.99	2.0	0.0005
45	at	3.99	2.0	0.0005
46	EWMA	4.18	1.4	0.0050
47	DEWMA	4.51	1.1	0.1000
48	EWMA	5.73	1.5	0.0010
49	DEWMA	6.00	1.7	0.0500
50	EWMA	6.70	1.3	0.0005
51	DEWMA	11.29	4.6	0.0100
52	DEWMA	15.60	5.4	0.0050
53	DEWMA	258.23	51.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-57

	Chart	ARL1	SD	Lambda
1	at	1.99	0.5	0.5000
2	Shewhart	2.04	0.6	0.0005
3	Shewhart	2.04	0.6	0.3000
4	EWMA	2.04	0.5	0.5000
5	Shewhart	2.04	0.6	0.0010
6	Shewhart	2.04	0.6	0.2000
7	Ft	2.05	0.5	0.3000
8	Shewhart	2.05	0.6	0.5000
9	Shewhart	2.05	0.6	0.1000
10	Shewhart	2.05	0.6	0.0050
11	Shewhart	2.05	0.6	0.0100
12	Shewhart	2.06	0.6	0.0500
13	at	2.06	0.5	0.3000
14	bt	2.08	0.5	0.3000
15	bt	2.14	0.5	0.2000
16	Ft	2.15	0.5	0.2000
17	at	2.17	0.5	0.2000
18	EWMA	2.17	0.5	0.3000
19	bt	2.19	0.6	0.5000
20	DEWMA	2.29	0.5	0.5000
21	EWMA	2.30	0.6	0.2000
22	bt	2.36	0.6	0.1000
23	Ft	2.43	0.6	0.1000
24	at	2.44	0.6	0.1000
25	Ft	2.46	0.5	0.5000
26	bt	2.62	0.6	0.0500
27	EWMA	2.62	0.6	0.1000
28	Ft	2.70	0.6	0.0500
29	at	2.70	0.6	0.0500
30	DEWMA	2.84	0.6	0.3000
31	EWMA	2.90	0.7	0.0500
32	bt	3.28	0.9	0.0100
33	DEWMA	3.37	0.7	0.2000
34	at	3.40	1.0	0.0100
35	Ft	3.40	1.0	0.0100
36	bt	3.56	1.1	0.0050
37	Ft	3.64	1.3	0.0050
38	at	3.65	1.3	0.0050
39	EWMA	3.73	1.2	0.0100
40	bt	3.89	1.8	0.0010
41	Ft	3.90	1.9	0.0010
42	at	3.92	1.9	0.0010
43	bt	3.97	2.0	0.0005
44	Ft	3.97	2.0	0.0005
45	at	3.98	2.0	0.0005
46	EWMA	4.17	1.4	0.0050
47	DEWMA	4.53	1.0	0.1000
48	EWMA	5.72	1.5	0.0010
49	DEWMA	5.99	1.7	0.0500
50	EWMA	6.69	1.4	0.0005
51	DEWMA	11.33	4.5	0.0100
52	DEWMA	15.52	5.5	0.0050
53	DEWMA	256.93	54.5	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-58

	Chart	ARL1	SD	Lambda
1	at	1.94	0.5	0.5000
2	Shewhart	1.96	0.6	0.0005
3	Shewhart	1.97	0.6	0.0100
4	Shewhart	1.97	0.6	0.0050
5	Shewhart	1.97	0.6	0.1000
6	Shewhart	1.97	0.5	0.3000
7	Shewhart	1.97	0.6	0.5000
8	Shewhart	1.98	0.5	0.0500
9	Shewhart	1.98	0.6	0.0010
10	Shewhart	1.98	0.6	0.2000
11	EWMA	1.98	0.4	0.5000
12	Ft	1.99	0.5	0.3000
13	at	2.00	0.4	0.3000
14	bt	2.02	0.5	0.3000
15	bt	2.07	0.5	0.2000
16	Ft	2.09	0.5	0.2000
17	at	2.10	0.5	0.2000
18	bt	2.10	0.6	0.5000
19	EWMA	2.10	0.5	0.3000
20	EWMA	2.23	0.5	0.2000
21	DEWMA	2.23	0.5	0.5000
22	bt	2.27	0.6	0.1000
23	Ft	2.35	0.6	0.1000
24	at	2.36	0.6	0.1000
25	Ft	2.37	0.5	0.5000
26	EWMA	2.55	0.6	0.1000
27	bt	2.55	0.6	0.0500
28	Ft	2.64	0.6	0.0500
29	at	2.64	0.6	0.0500
30	DEWMA	2.76	0.6	0.3000
31	EWMA	2.83	0.7	0.0500
32	bt	3.20	0.9	0.0100
33	DEWMA	3.30	0.7	0.2000
34	at	3.32	1.0	0.0100
35	Ft	3.32	1.0	0.0100
36	bt	3.46	1.1	0.0050
37	Ft	3.53	1.3	0.0050
38	at	3.54	1.3	0.0050
39	EWMA	3.64	1.1	0.0100
40	bt	3.83	1.8	0.0010
41	Ft	3.85	1.9	0.0010
42	at	3.87	1.8	0.0010
43	bt	3.90	1.9	0.0005
44	Ft	3.91	2.0	0.0005
45	at	3.91	2.0	0.0005
46	EWMA	4.06	1.4	0.0050
47	DEWMA	4.43	1.0	0.1000
48	EWMA	5.61	1.5	0.0010
49	DEWMA	5.90	1.6	0.0500
50	EWMA	6.54	1.3	0.0005
51	DEWMA	11.11	4.5	0.0100
52	DEWMA	15.25	5.3	0.0050
53	DEWMA	252.18	63.0	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-58

	Chart	ARL1	SD	Lambda
1	at	1.94	0.5	0.5000
2	Shewhart	1.97	0.6	0.0010
3	Shewhart	1.97	0.5	0.0500
4	Shewhart	1.97	0.6	0.0050
5	Shewhart	1.97	0.5	0.1000
6	Shewhart	1.97	0.6	0.5000
7	Shewhart	1.97	0.5	0.2000
8	Shewhart	1.97	0.6	0.3000
9	EWMA	1.98	0.5	0.5000
10	Shewhart	1.98	0.5	0.0100
11	Shewhart	1.98	0.5	0.0005
12	Ft	1.99	0.5	0.3000
13	at	2.01	0.5	0.3000
14	bt	2.02	0.5	0.3000
15	bt	2.07	0.5	0.2000
16	Ft	2.09	0.5	0.2000
17	at	2.10	0.5	0.2000
18	bt	2.11	0.6	0.5000
19	EWMA	2.11	0.5	0.3000
20	DEWMA	2.24	0.5	0.5000
21	EWMA	2.24	0.5	0.2000
22	bt	2.28	0.6	0.1000
23	Ft	2.35	0.6	0.1000
24	at	2.36	0.6	0.1000
25	Ft	2.38	0.5	0.5000
26	bt	2.54	0.6	0.0500
27	EWMA	2.55	0.6	0.1000
28	at	2.63	0.6	0.0500
29	Ft	2.63	0.6	0.0500
30	DEWMA	2.77	0.6	0.3000
31	EWMA	2.82	0.7	0.0500
32	bt	3.19	0.9	0.0100
33	at	3.30	1.0	0.0100
34	Ft	3.31	1.0	0.0100
35	DEWMA	3.31	0.7	0.2000
36	bt	3.45	1.1	0.0050
37	Ft	3.53	1.3	0.0050
38	at	3.53	1.3	0.0050
39	EWMA	3.63	1.1	0.0100
40	bt	3.83	1.8	0.0010
41	Ft	3.83	1.8	0.0010
42	at	3.86	1.8	0.0010
43	Ft	3.89	2.0	0.0005
44	bt	3.89	1.9	0.0005
45	at	3.90	2.0	0.0005
46	EWMA	4.04	1.4	0.0050
47	DEWMA	4.45	1.0	0.1000
48	EWMA	5.60	1.5	0.0010
49	DEWMA	5.90	1.6	0.0500
50	EWMA	6.53	1.3	0.0005
51	DEWMA	11.10	4.4	0.0100
52	DEWMA	15.21	5.3	0.0050
53	DEWMA	252.28	62.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-59

	Chart	ARL1	SD	Lambda
1	Shewhart	1.70	0.5	0.0010
2	Shewhart	1.70	0.5	0.0005
3	Shewhart	1.70	0.5	0.0050
4	Shewhart	1.70	0.5	0.2000
5	Shewhart	1.70	0.5	0.0500
6	Shewhart	1.70	0.5	0.0100
7	Shewhart	1.71	0.5	0.3000
8	Shewhart	1.71	0.5	0.1000
9	Shewhart	1.71	0.5	0.5000
10	at	1.74	0.5	0.5000
11	EWMA	1.79	0.4	0.5000
12	bt	1.80	0.5	0.5000
13	bt	1.81	0.4	0.3000
14	Ft	1.81	0.4	0.3000
15	at	1.83	0.4	0.3000
16	bt	1.87	0.4	0.2000
17	Ft	1.89	0.4	0.2000
18	at	1.90	0.4	0.2000
19	EWMA	1.91	0.4	0.3000
20	EWMA	1.98	0.4	0.2000
21	DEWMA	2.00	0.4	0.5000
22	bt	2.02	0.4	0.1000
23	Ft	2.04	0.4	0.5000
24	Ft	2.08	0.5	0.1000
25	at	2.09	0.5	0.1000
26	bt	2.27	0.6	0.0500
27	EWMA	2.28	0.6	0.1000
28	Ft	2.36	0.6	0.0500
29	at	2.36	0.6	0.0500
30	EWMA	2.54	0.6	0.0500
31	DEWMA	2.54	0.6	0.3000
32	bt	2.88	0.8	0.0100
33	at	2.97	0.9	0.0100
34	Ft	2.97	0.9	0.0100
35	DEWMA	3.01	0.7	0.2000
36	bt	3.10	1.0	0.0050
37	Ft	3.17	1.2	0.0050
38	at	3.18	1.1	0.0050
39	EWMA	3.26	1.0	0.0100
40	bt	3.41	1.6	0.0010
41	Ft	3.42	1.7	0.0010
42	at	3.44	1.7	0.0010
43	bt	3.50	1.7	0.0005
44	Ft	3.50	1.8	0.0005
45	at	3.50	1.8	0.0005
46	EWMA	3.63	1.2	0.0050
47	DEWMA	4.08	0.9	0.1000
48	EWMA	5.00	1.3	0.0010
49	DEWMA	5.39	1.5	0.0500
50	EWMA	5.86	1.2	0.0005
51	DEWMA	10.28	4.1	0.0100
52	DEWMA	14.13	4.9	0.0050
53	DEWMA	188.93	113.9	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-59

	Chart	ARL1	SD	Lambda
1	Shewhart	1.70	0.5	0.0100
2	Shewhart	1.70	0.5	0.1000
3	Shewhart	1.70	0.5	0.5000
4	Shewhart	1.71	0.5	0.0050
5	Shewhart	1.71	0.5	0.0010
6	Shewhart	1.71	0.5	0.3000
7	Shewhart	1.71	0.5	0.0005
8	Shewhart	1.71	0.5	0.0500
9	Shewhart	1.72	0.5	0.2000
10	at	1.73	0.5	0.5000
11	EWMA	1.80	0.4	0.5000
12	bt	1.80	0.5	0.5000
13	bt	1.81	0.4	0.3000
14	Ft	1.82	0.4	0.3000
15	at	1.83	0.4	0.3000
16	bt	1.87	0.4	0.2000
17	Ft	1.89	0.4	0.2000
18	at	1.90	0.4	0.2000
19	EWMA	1.90	0.4	0.3000
20	EWMA	1.99	0.4	0.2000
21	DEWMA	2.00	0.4	0.5000
22	bt	2.02	0.4	0.1000
23	Ft	2.04	0.4	0.5000
24	Ft	2.08	0.5	0.1000
25	at	2.08	0.5	0.1000
26	EWMA	2.27	0.6	0.1000
27	bt	2.28	0.6	0.0500
28	Ft	2.37	0.6	0.0500
29	at	2.38	0.6	0.0500
30	DEWMA	2.53	0.6	0.3000
31	EWMA	2.56	0.6	0.0500
32	bt	2.86	0.8	0.0100
33	at	2.96	0.9	0.0100
34	Ft	2.96	0.9	0.0100
35	DEWMA	3.01	0.7	0.2000
36	bt	3.13	1.0	0.0050
37	Ft	3.19	1.1	0.0050
38	at	3.20	1.1	0.0050
39	EWMA	3.26	1.0	0.0100
40	bt	3.42	1.6	0.0010
41	Ft	3.43	1.7	0.0010
42	at	3.44	1.7	0.0010
43	bt	3.49	1.7	0.0005
44	Ft	3.50	1.8	0.0005
45	at	3.50	1.8	0.0005
46	EWMA	3.65	1.2	0.0050
47	DEWMA	4.06	1.0	0.1000
48	EWMA	5.01	1.3	0.0010
49	DEWMA	5.45	1.5	0.0500
50	EWMA	5.86	1.2	0.0005
51	DEWMA	10.23	4.2	0.0100
52	DEWMA	14.17	4.8	0.0050
53	DEWMA	190.61	113.3	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B1-60

	Chart	ARL1	SD	Lambda
1	Shewhart	1.49	0.5	0.0005
2	Shewhart	1.49	0.5	0.0500
3	Shewhart	1.50	0.5	0.0010
4	Shewhart	1.50	0.5	0.1000
5	Shewhart	1.50	0.5	0.3000
6	Shewhart	1.50	0.5	0.2000
7	Shewhart	1.50	0.5	0.0050
8	Shewhart	1.50	0.5	0.0100
9	Shewhart	1.51	0.5	0.5000
10	at	1.57	0.5	0.5000
11	bt	1.60	0.5	0.5000
12	EWMA	1.65	0.5	0.5000
13	bt	1.66	0.5	0.3000
14	Ft	1.66	0.5	0.3000
15	at	1.68	0.5	0.3000
16	bt	1.74	0.4	0.2000
17	Ft	1.77	0.4	0.2000
18	EWMA	1.78	0.4	0.3000
19	at	1.78	0.4	0.2000
20	EWMA	1.86	0.4	0.2000
21	Ft	1.87	0.4	0.5000
22	bt	1.88	0.4	0.1000
23	DEWMA	1.88	0.4	0.5000
24	Ft	1.92	0.4	0.1000
25	at	1.92	0.4	0.1000
26	EWMA	2.05	0.5	0.1000
27	bt	2.06	0.5	0.0500
28	Ft	2.14	0.5	0.0500
29	at	2.14	0.5	0.0500
30	EWMA	2.32	0.6	0.0500
31	DEWMA	2.32	0.6	0.3000
32	bt	2.62	0.8	0.0100
33	at	2.70	0.8	0.0100
34	Ft	2.70	0.8	0.0100
35	DEWMA	2.80	0.6	0.2000
36	bt	2.86	0.9	0.0050
37	Ft	2.92	1.1	0.0050
38	at	2.93	1.0	0.0050
39	EWMA	2.98	0.9	0.0100
40	bt	3.12	1.5	0.0010
41	Ft	3.13	1.5	0.0010
42	at	3.15	1.5	0.0010
43	bt	3.21	1.6	0.0005
44	Ft	3.22	1.6	0.0005
45	at	3.22	1.6	0.0005
46	EWMA	3.34	1.1	0.0050
47	DEWMA	3.78	0.9	0.1000
48	EWMA	4.58	1.2	0.0010
49	DEWMA	5.05	1.4	0.0500
50	EWMA	5.35	1.1	0.0005
51	DEWMA	9.57	3.9	0.0100
52	DEWMA	13.28	4.6	0.0050
53	DEWMA	98.82	109.7	0.0010
54	DEWMA	270.00	0.0	0.0005

Table B2-60

	Chart	ARL1	SD	Lambda
1	Shewhart	1.49	0.5	0.0005
2	Shewhart	1.49	0.5	0.0050
3	Shewhart	1.49	0.5	0.2000
4	Shewhart	1.49	0.5	0.3000
5	Shewhart	1.49	0.5	0.5000
6	Shewhart	1.49	0.5	0.1000
7	Shewhart	1.50	0.5	0.0500
8	Shewhart	1.51	0.5	0.0100
9	Shewhart	1.51	0.5	0.0010
10	at	1.55	0.5	0.5000
11	bt	1.58	0.5	0.5000
12	EWMA	1.64	0.5	0.5000
13	bt	1.66	0.5	0.3000
14	Ft	1.66	0.5	0.3000
15	at	1.69	0.5	0.3000
16	bt	1.74	0.4	0.2000
17	Ft	1.77	0.4	0.2000
18	at	1.78	0.4	0.2000
19	EWMA	1.78	0.4	0.3000
20	EWMA	1.85	0.4	0.2000
21	DEWMA	1.88	0.4	0.5000
22	bt	1.88	0.4	0.1000
23	Ft	1.88	0.4	0.5000
24	Ft	1.92	0.4	0.1000
25	at	1.92	0.4	0.1000
26	EWMA	2.05	0.5	0.1000
27	bt	2.07	0.5	0.0500
28	Ft	2.15	0.5	0.0500
29	at	2.15	0.5	0.0500
30	DEWMA	2.32	0.6	0.3000
31	EWMA	2.34	0.6	0.0500
32	bt	2.63	0.7	0.0100
33	at	2.72	0.8	0.0100
34	Ft	2.73	0.8	0.0100
35	DEWMA	2.79	0.6	0.2000
36	bt	2.83	0.9	0.0050
37	Ft	2.90	1.1	0.0050
38	at	2.91	1.1	0.0050
39	EWMA	2.99	0.9	0.0100
40	bt	3.11	1.5	0.0010
41	Ft	3.12	1.5	0.0010
42	at	3.14	1.5	0.0010
43	bt	3.21	1.6	0.0005
44	Ft	3.21	1.6	0.0005
45	at	3.22	1.6	0.0005
46	EWMA	3.32	1.1	0.0050
47	DEWMA	3.78	0.9	0.1000
48	EWMA	4.55	1.2	0.0010
49	DEWMA	5.09	1.4	0.0500
50	EWMA	5.34	1.1	0.0005
51	DEWMA	9.66	3.9	0.0100
52	DEWMA	13.20	4.7	0.0050
53	DEWMA	97.39	109.1	0.0010
54	DEWMA	270.00	0.0	0.0005

Chart	ARL1	SD1	Lambda	slope
Ft	262.89	42.66	0.001	0.0005
Ft	264.25	38.46	0.0005	0.0005
Ft	264.50	37.58	0.005	0.0005
Ft	266.19	31.22	0.01	0.0005
Ft	267.14	26.88	0.05	0.0005
Shewhart	267.15	26.81	0.001	0.0005
Shewhart	267.39	25.65	0.05	0.0005
Shewhart	267.52	25.04	0.01	0.0005
Ft	267.54	25.00	0.1	0.0005
Shewhart	267.56	24.82	0.2	0.0005
Ft	267.60	24.61	0.5	0.0005
Shewhart	267.66	24.27	0.5	0.0005
Shewhart	267.67	24.24	0.1	0.0005
Shewhart	267.71	24.10	0.0005	0.0005
Shewhart	267.72	23.97	0.3	0.0005
Shewhart	267.75	23.85	0.005	0.0005
Ft	267.86	23.32	0.3	0.0005
Ft	268.32	20.53	0.2	0.0005

Chart	ARL1	SD1	Lambda	slope
Ft	262.42	44.06	0.001	0.001
Ft	263.30	41.48	0.0005	0.001
Ft	264.38	37.87	0.005	0.001
Ft	265.81	32.72	0.01	0.001
Ft	267.17	26.71	0.05	0.001
Ft	267.21	26.57	0.2	0.001
Shewhart	267.32	25.90	0.05	0.001
Ft	267.33	25.98	0.1	0.001
Shewhart	267.42	25.55	0.5	0.001
Shewhart	267.55	24.88	0.1	0.001
Ft	267.58	24.72	0.3	0.001
Shewhart	267.59	24.64	0.001	0.001
Ft	267.62	24.63	0.5	0.001
Shewhart	267.64	24.43	0.0005	0.001
Shewhart	267.79	23.63	0.005	0.001
Shewhart	267.90	22.95	0.01	0.001
Shewhart	268.05	22.19	0.3	0.001
Shewhart	268.26	21.02	0.2	0.001

	ARL1	SD1	Lambda	slope

Chart				
Ft	261.55	46.30	0.001	0.005
Ft	262.72	43.03	0.0005	0.005
Ft	263.21	41.22	0.005	0.005
Ft	264.37	37.55	0.01	0.005
Ft	264.94	35.35	0.05	0.005
Ft	265.57	33.19	0.1	0.005
Ft	265.89	32.06	0.2	0.005
Ft	266.23	30.70	0.3	0.005
Shewhart	266.54	29.35	0.1	0.005
Shewhart	266.60	29.20	0.3	0.005
Shewhart	266.69	28.87	0.005	0.005
Shewhart	267.00	27.44	0.05	0.005
Shewhart	267.02	27.25	0.5	0.005
Ft	267.07	27.07	0.5	0.005
Shewhart	267.08	27.06	0.2	0.005
Shewhart	267.15	26.77	0.01	0.005
Shewhart	267.19	26.56	0.001	0.005
Shewhart	267.29	26.24	0.0005	0.005

Chart	ARL1	SD1	Lambda	slope
Ft	258.57	52.03	0.05	0.01
Ft	259.47	50.19	0.1	0.01
Ft	259.53	50.62	0.005	0.01
Ft	259.65	50.10	0.01	0.01
Ft	260.07	49.66	0.001	0.01
Ft	261.33	46.54	0.0005	0.01
Ft	263.28	40.50	0.2	0.01
Ft	264.84	35.66	0.3	0.01
Shewhart	265.36	33.88	0.01	0.01
Ft	265.37	33.82	0.5	0.01
Shewhart	265.81	32.29	0.2	0.01
Shewhart	265.97	31.65	0.001	0.01
Shewhart	266.02	31.40	0.1	0.01
Shewhart	266.03	31.33	0.0005	0.01
Shewhart	266.23	30.58	0.5	0.01
Shewhart	266.37	30.16	0.3	0.01
Shewhart	266.38	30.04	0.05	0.01
Shewhart	266.42	29.85	0.005	0.01

Chart	ARL1	SD1	Lambda	slope
Ft	32.66	51.24	0.05	0.05
Ft	43.03	69.48	0.1	0.05
Ft	72.51	98.05	0.01	0.05
Ft	99.38	114.49	0.2	0.05
Ft	122.93	120.67	0.005	0.05
Ft	155.55	123.13	0.3	0.05
Ft	196.55	113.05	0.001	0.05
Ft	210.49	105.76	0.0005	0.05
Ft	220.65	98.72	0.5	0.05
Shewhart	220.74	98.62	0.05	0.05
Shewhart	221.37	98.16	0.2	0.05
Shewhart	222.11	97.59	0.5	0.05
Shewhart	222.18	97.54	0.01	0.05
Shewhart	222.46	97.27	0.0005	0.05
Shewhart	222.80	96.99	0.1	0.05
Shewhart	223.08	96.85	0.001	0.05
Shewhart	223.10	96.81	0.005	0.05
Shewhart	223.12	96.77	0.3	0.05

Chart	ARL1	SD1	Lambda	slope
Ft	14.32	3.30	0.1	0.1
Ft	14.66	3.08	0.05	0.1
Ft	15.69	6.00	0.2	0.1
Ft	17.92	3.94	0.01	0.1
Ft	18.19	12.28	0.3	0.1
Ft	20.07	9.91	0.005	0.1
Shewhart	41.15	66.34	0.005	0.1
Shewhart	41.46	66.85	0.05	0.1
Shewhart	41.98	67.61	0.1	0.1
Shewhart	42.02	67.83	0.3	0.1
Shewhart	42.16	67.97	0.0005	0.1
Shewhart	42.36	68.18	0.5	0.1
Shewhart	42.43	68.43	0.001	0.1
Shewhart	42.91	69.09	0.01	0.1
Shewhart	43.20	69.45	0.2	0.1
Ft	46.07	74.08	0.5	0.1
Ft	57.81	86.46	0.001	0.1
Ft	80.55	104.43	0.0005	0.1

Chart	ARL1	SD1	Lambda	slope
Ft	5.17	1.11	0.2	0.5
Ft	5.22	1.21	0.3	0.5
Ft	5.45	1.06	0.1	0.5
Ft	5.99	1.54	0.5	0.5
Ft	5.99	1.15	0.05	0.5
Shewhart	6.36	1.55	0.3	0.5
Shewhart	6.38	1.55	0.05	0.5
Shewhart	6.38	1.53	0.0005	0.5
Shewhart	6.38	1.53	0.001	0.5
Shewhart	6.39	1.55	0.005	0.5
Shewhart	6.39	1.55	0.5	0.5
Shewhart	6.40	1.55	0.2	0.5
Shewhart	6.40	1.52	0.01	0.5
Shewhart	6.41	1.55	0.1	0.5
Ft	7.84	1.69	0.01	0.5
Ft	8.73	2.10	0.005	0.5
Ft	10.76	2.91	0.001	0.5
Ft	11.41	2.96	0.0005	0.5

Chart	ARL1	SD1	Lambda	slope
Ft	3.30	0.73	0.3	1
Ft	3.40	0.69	0.2	1
Ft	3.46	0.84	0.5	1
Shewhart	3.71	0.91	0.0005	1
Shewhart	3.71	0.91	0.05	1
Ft	3.71	0.71	0.1	1
Shewhart	3.71	0.90	0.005	1
Shewhart	3.72	0.90	0.5	1
Shewhart	3.72	0.90	0.01	1
Shewhart	3.72	0.90	0.1	1
Shewhart	3.72	0.90	0.3	1
Shewhart	3.72	0.90	0.2	1
Shewhart	3.74	0.90	0.001	1
Ft	4.16	0.79	0.05	1
Ft	5.51	1.18	0.01	1
Ft	6.18	1.47	0.005	1
Ft	7.61	2.05	0.001	1
Ft	8.09	2.10	0.0005	1

Chart	ARL1	SD1	Lambda	slope
Ft	2.12	0.50	0.5	2
Ft	2.15	0.47	0.3	2
Shewhart	2.19	0.56	0.001	2
Shewhart	2.19	0.56	0.1	2
Shewhart	2.19	0.56	0.0005	2
Shewhart	2.19	0.56	0.05	2
Shewhart	2.20	0.56	0.2	2
Shewhart	2.20	0.56	0.5	2
Shewhart	2.20	0.57	0.005	2
Shewhart	2.20	0.57	0.3	2
Shewhart	2.20	0.55	0.01	2
Ft	2.28	0.51	0.2	2
Ft	2.59	0.54	0.1	2
Ft	2.92	0.58	0.05	2
Ft	3.90	0.85	0.01	2
Ft	4.36	1.05	0.005	2
Ft	5.38	1.45	0.001	2
Ft	5.74	1.48	0.0005	2

Chart	ARL1	SD1	Lambda	slope
Shewhart	1.67	0.48	0.005	3
Shewhart	1.67	0.48	0.3	3
Shewhart	1.67	0.48	0.2	3
Shewhart	1.67	0.48	0.0005	3
Shewhart	1.67	0.48	0.01	3
Shewhart	1.67	0.48	0.05	3
Shewhart	1.67	0.48	0.001	3
Shewhart	1.68	0.48	0.5	3
Shewhart	1.69	0.47	0.1	3
Ft	1.71	0.46	0.5	3
Ft	1.81	0.40	0.3	3
Ft	1.89	0.34	0.2	3
Ft	2.06	0.39	0.1	3
Ft	2.38	0.54	0.05	3
Ft	3.19	0.71	0.01	3
Ft	3.59	0.87	0.005	3
Ft	4.39	1.20	0.001	3
Ft	4.66	1.25	0.0005	3

Chart	ARL1	SD1	Lambda	slope
Shewhart	1.29	0.45	0.3	4
Shewhart	1.29	0.45	0.01	4
Shewhart	1.29	0.45	0.05	4
Shewhart	1.29	0.45	0.005	4
Shewhart	1.29	0.46	0.1	4
Shewhart	1.29	0.46	0.001	4
Shewhart	1.29	0.46	0.0005	4
Shewhart	1.30	0.46	0.2	4
Shewhart	1.30	0.46	0.5	4
Ft	1.35	0.48	0.5	4
Ft	1.52	0.50	0.3	4
Ft	1.69	0.46	0.2	4
Ft	1.87	0.35	0.1	4
Ft	2.03	0.39	0.05	4
Ft	2.76	0.62	0.01	4
Ft	3.11	0.77	0.005	4
Ft	3.82	1.03	0.001	4
Ft	4.06	1.06	0.0005	4

APPENDIX C

AVERAGE RUNNING LENGTH UNDER SHIFT CONDITION

Table D3-1

Average running length under shift = 0.001

	Chart	ARL1	SD	Lambda	shift
1	Ft	223.26	101.2	0.0005	0.001
2	at	223.50	100.9	0.0005	0.001
3	bt	225.01	99.6	0.0005	0.001
4	Ft	225.25	99.4	0.0010	0.001
5	at	226.33	98.4	0.0010	0.001
6	bt	228.87	96.0	0.0010	0.001
7	DEWMA	241.20	82.8	0.0100	0.001
8	Ft	243.53	79.2	0.0050	0.001
9	at	244.01	78.5	0.0050	0.001
10	DEWMA	248.16	73.1	0.0050	0.001
11	bt	250.19	69.3	0.0050	0.001
12	EWMA	250.96	68.3	0.0050	0.001
13	Ft	251.61	66.8	0.0100	0.001
14	at	251.67	66.7	0.0100	0.001
15	DEWMA	252.44	65.5	0.0500	0.001
16	EWMA	252.77	64.9	0.0100	0.001
17	bt	253.01	64.2	0.0100	0.001
18	DEWMA	256.14	58.3	0.1000	0.001
19	EWMA	256.84	56.8	0.0500	0.001
20	EWMA	257.06	56.1	0.2000	0.001
21	DEWMA	257.11	56.1	0.2000	0.001
22	at	258.28	53.7	0.0500	0.001
23	Ft	258.36	53.5	0.0500	0.001
24	EWMA	258.44	53.2	0.1000	0.001
25	bt	258.46	53.0	0.1000	0.001
26	DEWMA	258.74	52.5	0.3000	0.001
27	Ft	258.85	52.3	0.1000	0.001
28	Shewhart	258.95	52.0	0.1000	0.001
29	bt	258.95	51.9	0.3000	0.001
30	bt	258.98	52.0	0.0500	0.001
31	Ft	259.06	51.8	0.2000	0.001
32	Ft	259.09	51.6	0.3000	0.001
33	Shewhart	259.41	50.9	0.0500	0.001
34	Shewhart	259.42	50.9	0.0050	0.001
35	bt	259.49	50.8	0.2000	0.001
36	Shewhart	259.52	50.7	0.2000	0.001
37	at	259.53	50.7	0.1000	0.001
38	bt	259.62	50.4	0.5000	0.001
39	at	259.65	50.4	0.2000	0.001
40	Shewhart	259.71	50.2	0.3000	0.001
41	at	259.80	50.0	0.3000	0.001
42	Shewhart	259.85	49.9	0.0100	0.001
43	Shewhart	259.88	49.9	0.0010	0.001
44	EWMA	259.90	49.7	0.3000	0.001
45	Shewhart	259.94	49.6	0.5000	0.001
46	Shewhart	260.10	49.3	0.0005	0.001
47	DEWMA	260.44	48.5	0.5000	0.001
48	at	260.91	47.3	0.5000	0.001
49	EWMA	261.05	47.0	0.5000	0.001
50	EWMA	264.34	38.2	0.0010	0.001
51	EWMA	268.80	17.6	0.0005	0.001
52	Ft	269.82	6.8	0.5000	0.001
53	DEWMA	270.00	0.0	0.0005	0.001
54	DEWMA	270.00	0.0	0.0010	0.001

Table D4-1

	Chart	ARL1	SD	Lambda
1	Ft	224.18	100.5	0.0005
2	at	224.21	100.5	0.0005
3	Ft	226.14	98.6	0.0010
4	bt	226.22	98.7	0.0005
5	at	227.38	97.4	0.0010
6	bt	229.74	95.1	0.0010
7	DEWMA	241.03	83.1	0.0100
8	Ft	243.38	79.3	0.0050
9	at	244.02	78.4	0.0050
10	DEWMA	248.75	72.3	0.0050
11	bt	249.96	69.6	0.0050
12	Ft	251.19	67.5	0.0100
13	EWMA	251.35	67.6	0.0050
14	at	251.35	67.2	0.0100
15	bt	252.41	65.3	0.0100
16	EWMA	253.15	64.2	0.0100
17	DEWMA	253.16	64.3	0.0500
18	DEWMA	256.35	57.9	0.1000
19	EWMA	257.20	56.0	0.0500
20	EWMA	257.24	55.7	0.2000
21	bt	257.73	54.7	0.0500
22	Ft	257.99	54.2	0.0500
23	at	258.15	53.8	0.0500
24	Ft	258.26	53.5	0.2000
25	Ft	258.51	53.0	0.1000
26	DEWMA	258.59	52.9	0.2000
27	bt	258.66	52.6	0.2000
28	at	258.74	52.4	0.2000
29	Shewhart	258.77	52.4	0.0010
30	bt	258.82	52.2	0.1000
31	EWMA	258.94	52.1	0.1000
32	DEWMA	259.02	52.0	0.3000
33	Shewhart	259.08	51.7	0.0500
34	Shewhart	259.23	51.2	0.0005
35	at	259.25	51.3	0.1000
36	Shewhart	259.35	51.0	0.1000
37	Shewhart	259.37	51.1	0.0100
38	Shewhart	259.42	50.9	0.5000
39	Shewhart	259.45	50.9	0.3000
40	bt	259.68	50.3	0.5000
41	at	259.71	50.3	0.5000
42	Shewhart	259.86	49.9	0.2000
43	bt	260.02	49.5	0.3000
44	Shewhart	260.07	49.4	0.0050
45	DEWMA	260.12	49.3	0.5000
46	Ft	260.36	48.7	0.3000
47	EWMA	260.56	48.2	0.3000
48	EWMA	260.68	48.0	0.5000
49	at	260.88	47.4	0.3000
50	EWMA	263.81	39.9	0.0010
51	EWMA	268.52	19.5	0.0005
52	Ft	269.77	7.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-2

Average running length under shift = 0.005

	Chart	ARL1	SD	Lambda	shift
1	Ft	221.49	102.7	0.0005	0.005
2	at	221.80	102.4	0.0005	0.005
3	bt	223.59	100.9	0.0005	0.005
4	Ft	227.02	97.8	0.0010	0.005
5	at	228.03	96.9	0.0010	0.005
6	bt	230.40	94.5	0.0010	0.005
7	DEWMA	242.07	81.8	0.0100	0.005
8	Ft	244.52	77.8	0.0050	0.005
9	at	245.29	76.8	0.0050	0.005
10	bt	249.75	70.0	0.0050	0.005
11	DEWMA	250.20	69.9	0.0050	0.005
12	Ft	251.06	67.6	0.0100	0.005
13	at	251.24	67.3	0.0100	0.005
14	EWMA	252.06	66.3	0.0050	0.005
15	EWMA	252.58	65.1	0.0100	0.005
16	bt	253.02	64.2	0.0100	0.005
17	DEWMA	253.12	64.3	0.0500	0.005
18	DEWMA	255.83	58.9	0.1000	0.005
19	EWMA	257.19	55.9	0.0500	0.005
20	bt	257.73	54.7	0.1000	0.005
21	EWMA	257.80	54.6	0.1000	0.005
22	EWMA	257.86	54.5	0.2000	0.005
23	Ft	257.95	54.3	0.1000	0.005
24	bt	258.09	53.9	0.0500	0.005
25	Ft	258.24	53.6	0.0500	0.005
26	Shewhart	258.28	53.4	0.0100	0.005
27	DEWMA	258.36	53.5	0.2000	0.005
28	at	258.48	53.1	0.1000	0.005
29	at	258.52	53.0	0.0500	0.005
30	Ft	258.56	52.9	0.2000	0.005
31	DEWMA	258.92	52.0	0.3000	0.005
32	bt	259.09	51.6	0.3000	0.005
33	Shewhart	259.09	51.6	0.2000	0.005
34	EWMA	259.16	51.4	0.5000	0.005
35	bt	259.18	51.5	0.2000	0.005
36	at	259.22	51.4	0.2000	0.005
37	Shewhart	259.24	51.3	0.0500	0.005
38	Shewhart	259.31	51.1	0.5000	0.005
39	at	259.35	51.0	0.5000	0.005
40	EWMA	259.36	51.0	0.3000	0.005
41	Ft	259.36	51.0	0.3000	0.005
42	Shewhart	259.48	50.7	0.0005	0.005
43	Shewhart	259.55	50.5	0.0010	0.005
44	bt	259.56	50.5	0.5000	0.005
45	Shewhart	259.60	50.4	0.3000	0.005
46	Shewhart	259.62	50.4	0.1000	0.005
47	at	260.00	49.5	0.3000	0.005
48	DEWMA	260.01	49.5	0.5000	0.005
49	Shewhart	260.14	49.2	0.0050	0.005
50	EWMA	264.29	38.3	0.0010	0.005
51	EWMA	268.49	19.9	0.0005	0.005
52	Ft	269.83	6.6	0.5000	0.005
53	DEWMA	270.00	0.0	0.0005	0.005
54	DEWMA	270.00	0.0	0.0010	0.005

Table D4-2

	Chart	ARL1	SD	Lambda
1	Ft	222.61	101.8	0.0005
2	at	222.65	101.7	0.0005
3	Ft	223.64	100.8	0.0010
4	bt	224.66	100.0	0.0005
5	at	224.85	99.7	0.0010
6	bt	227.38	97.4	0.0010
7	DEWMA	241.13	82.9	0.0100
8	Ft	244.22	78.2	0.0050
9	at	244.43	77.9	0.0050
10	bt	248.89	71.2	0.0050
11	DEWMA	249.63	70.9	0.0050
12	Ft	250.65	68.4	0.0100
13	at	250.82	68.1	0.0100
14	bt	252.15	65.8	0.0100
15	EWMA	252.19	66.1	0.0050
16	EWMA	252.44	65.4	0.0100
17	DEWMA	252.90	64.7	0.0500
18	DEWMA	256.86	56.6	0.2000
19	DEWMA	256.93	56.6	0.1000
20	EWMA	257.05	56.2	0.2000
21	EWMA	257.14	56.1	0.0500
22	bt	257.38	55.5	0.0500
23	Ft	257.78	54.5	0.3000
24	Ft	258.26	53.6	0.0500
25	at	258.31	53.3	0.3000
26	DEWMA	258.72	52.6	0.3000
27	Shewhart	258.83	52.2	0.0010
28	Ft	258.90	52.1	0.2000
29	at	258.96	52.1	0.0500
30	EWMA	259.09	51.7	0.3000
31	DEWMA	259.10	51.6	0.5000
32	EWMA	259.19	51.4	0.5000
33	Shewhart	259.21	51.4	0.3000
34	Shewhart	259.24	51.3	0.0100
35	Ft	259.31	51.2	0.1000
36	bt	259.31	51.1	0.1000
37	EWMA	259.32	51.2	0.1000
38	bt	259.35	51.0	0.5000
39	Shewhart	259.41	50.9	0.5000
40	bt	259.42	50.9	0.3000
41	bt	259.47	50.9	0.2000
42	at	259.59	50.5	0.2000
43	Shewhart	259.62	50.5	0.0500
44	at	259.63	50.5	0.1000
45	Shewhart	259.70	50.2	0.0050
46	Shewhart	259.75	50.2	0.0005
47	at	259.97	49.6	0.5000
48	Shewhart	260.04	49.5	0.2000
49	Shewhart	260.57	48.1	0.1000
50	EWMA	263.81	39.9	0.0010
51	EWMA	268.57	19.3	0.0005
52	Ft	269.85	6.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-3

Average running length under shift = 0.01

	Chart	ARL1	SD	Lambda	shift
1	Ft	221.80	102.5	0.0005	0.01
2	at	221.97	102.3	0.0005	0.01
3	bt	223.75	100.8	0.0005	0.01
4	Ft	224.71	99.9	0.0010	0.01
5	at	226.23	98.6	0.0010	0.01
6	bt	228.43	96.5	0.0010	0.01
7	DEWMA	240.78	83.3	0.0100	0.01
8	Ft	243.78	78.8	0.0050	0.01
9	at	244.73	77.5	0.0050	0.01
10	DEWMA	249.27	71.4	0.0050	0.01
11	bt	249.59	70.1	0.0050	0.01
12	at	251.00	67.8	0.0100	0.01
13	Ft	251.43	67.1	0.0100	0.01
14	EWMA	251.61	67.1	0.0050	0.01
15	EWMA	252.44	65.5	0.0100	0.01
16	bt	253.12	64.0	0.0100	0.01
17	DEWMA	253.94	62.7	0.0500	0.01
18	DEWMA	255.94	58.5	0.1000	0.01
19	EWMA	256.93	56.4	0.0500	0.01
20	EWMA	257.12	56.0	0.2000	0.01
21	bt	257.85	54.4	0.0500	0.01
22	Ft	257.93	54.2	0.1000	0.01
23	bt	257.95	54.2	0.1000	0.01
24	Ft	258.02	54.0	0.0500	0.01
25	DEWMA	258.02	54.2	0.2000	0.01
26	Ft	258.23	53.6	0.2000	0.01
27	at	258.23	53.5	0.0500	0.01
28	DEWMA	258.26	53.5	0.3000	0.01
29	Shewhart	258.30	53.4	0.0005	0.01
30	EWMA	258.56	52.9	0.1000	0.01
31	Shewhart	258.59	52.8	0.5000	0.01
32	Shewhart	258.72	52.5	0.0500	0.01
33	at	258.76	52.4	0.1000	0.01
34	bt	258.90	52.1	0.5000	0.01
35	Shewhart	258.95	51.9	0.2000	0.01
36	at	258.95	52.0	0.2000	0.01
37	Shewhart	258.97	51.9	0.0100	0.01
38	bt	259.00	51.9	0.2000	0.01
39	Shewhart	259.05	51.8	0.1000	0.01
40	DEWMA	259.27	51.3	0.5000	0.01
41	Shewhart	259.30	51.2	0.0010	0.01
42	Ft	259.32	51.2	0.3000	0.01
43	EWMA	259.33	51.1	0.3000	0.01
44	EWMA	259.48	50.8	0.5000	0.01
45	at	259.75	50.2	0.5000	0.01
46	at	259.81	50.0	0.3000	0.01
47	Shewhart	259.91	49.7	0.0050	0.01
48	Shewhart	260.06	49.4	0.3000	0.01
49	bt	260.17	49.1	0.3000	0.01
50	EWMA	263.65	40.4	0.0010	0.01
51	EWMA	268.28	21.1	0.0005	0.01
52	Ft	269.67	9.2	0.5000	0.01
53	DEWMA	270.00	0.0	0.0005	0.01
54	DEWMA	270.00	0.0	0.0010	0.01

Table D4-3

	Chart	ARL1	SD	Lambda
1	Ft	222.03	102.1	0.0005
2	at	222.91	101.4	0.0005
3	bt	224.52	100.0	0.0005
4	Ft	225.64	99.0	0.0010
5	at	226.76	98.0	0.0010
6	bt	228.70	96.2	0.0010
7	DEWMA	239.53	84.9	0.0100
8	Ft	242.71	80.2	0.0050
9	at	243.75	78.8	0.0050
10	bt	248.80	71.4	0.0050
11	DEWMA	249.63	70.8	0.0050
12	Ft	250.25	68.8	0.0100
13	at	250.62	68.3	0.0100
14	EWMA	251.04	68.0	0.0050
15	EWMA	251.59	66.9	0.0100
16	bt	251.75	66.3	0.0100
17	DEWMA	253.34	63.9	0.0500
18	DEWMA	255.20	60.1	0.1000
19	EWMA	256.39	57.6	0.0500
20	Ft	257.09	56.0	0.1000
21	Ft	257.43	55.3	0.0500
22	DEWMA	257.72	54.9	0.2000
23	at	257.82	54.5	0.0500
24	at	257.83	54.5	0.1000
25	bt	257.83	54.4	0.1000
26	EWMA	257.94	54.3	0.1000
27	EWMA	258.00	54.0	0.2000
28	bt	258.37	53.3	0.0500
29	Ft	258.58	52.8	0.3000
30	Shewhart	258.71	52.5	0.5000
31	DEWMA	258.89	52.2	0.3000
32	Shewhart	258.96	52.0	0.0500
33	Ft	258.99	51.9	0.2000
34	Shewhart	259.08	51.7	0.0100
35	DEWMA	259.09	51.7	0.5000
36	EWMA	259.19	51.4	0.3000
37	Shewhart	259.22	51.3	0.0050
38	Shewhart	259.39	51.0	0.1000
39	Shewhart	259.46	50.8	0.0010
40	EWMA	259.49	50.7	0.5000
41	at	259.53	50.6	0.5000
42	at	259.56	50.6	0.3000
43	Shewhart	259.57	50.5	0.0005
44	Shewhart	259.59	50.5	0.2000
45	bt	259.59	50.4	0.3000
46	bt	259.64	50.5	0.2000
47	at	259.98	49.6	0.2000
48	bt	260.01	49.5	0.5000
49	Shewhart	260.17	49.1	0.3000
50	EWMA	263.34	41.4	0.0010
51	EWMA	268.80	17.7	0.0005
52	Ft	269.67	9.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-4

Average running length under shift = 0.02

	Chart	ARL1	SD	Lambda	shift
1	Ft	221.72	102.4	0.0005	0.02
2	at	221.93	102.2	0.0005	0.02
3	Ft	222.89	101.4	0.0010	0.02
4	bt	223.91	100.5	0.0005	0.02
5	at	224.02	100.4	0.0010	0.02
6	bt	226.48	98.1	0.0010	0.02
7	DEWMA	239.47	85.0	0.0100	0.02
8	Ft	243.45	79.1	0.0050	0.02
9	at	244.17	78.2	0.0050	0.02
10	DEWMA	248.47	72.6	0.0050	0.02
11	Ft	248.82	71.1	0.0100	0.02
12	at	249.22	70.5	0.0100	0.02
13	bt	249.61	70.1	0.0050	0.02
14	DEWMA	250.68	68.3	0.0500	0.02
15	bt	250.76	67.9	0.0100	0.02
16	EWMA	250.98	68.1	0.0050	0.02
17	EWMA	251.63	66.8	0.0100	0.02
18	DEWMA	254.57	61.2	0.1000	0.02
19	EWMA	254.96	60.4	0.0500	0.02
20	EWMA	256.12	57.9	0.2000	0.02
21	Ft	256.27	57.8	0.0500	0.02
22	bt	256.70	56.9	0.0500	0.02
23	DEWMA	256.77	56.7	0.3000	0.02
24	at	256.82	56.7	0.0500	0.02
25	DEWMA	257.09	56.1	0.2000	0.02
26	EWMA	257.23	55.7	0.1000	0.02
27	Ft	257.55	55.0	0.2000	0.02
28	EWMA	257.80	54.5	0.3000	0.02
29	Ft	257.88	54.3	0.1000	0.02
30	Ft	258.09	53.9	0.3000	0.02
31	at	258.26	53.5	0.1000	0.02
32	Shewhart	258.38	53.2	0.0050	0.02
33	at	258.46	53.0	0.2000	0.02
34	Shewhart	258.50	53.0	0.0100	0.02
35	bt	258.59	52.8	0.1000	0.02
36	bt	258.67	52.6	0.2000	0.02
37	Shewhart	258.72	52.6	0.3000	0.02
38	Shewhart	258.80	52.3	0.2000	0.02
39	Shewhart	258.86	52.1	0.5000	0.02
40	Shewhart	258.87	52.2	0.0500	0.02
41	bt	258.99	51.9	0.3000	0.02
42	DEWMA	259.03	51.7	0.5000	0.02
43	Shewhart	259.04	51.8	0.1000	0.02
44	at	259.20	51.4	0.5000	0.02
45	Shewhart	259.21	51.4	0.0005	0.02
46	at	259.30	51.2	0.3000	0.02
47	EWMA	259.31	51.1	0.5000	0.02
48	Shewhart	259.60	50.5	0.0010	0.02
49	bt	259.69	50.3	0.5000	0.02
50	EWMA	263.48	40.8	0.0010	0.02
51	EWMA	268.44	20.1	0.0005	0.02
52	Ft	269.67	9.1	0.5000	0.02
53	DEWMA	270.00	0.0	0.0005	0.02
54	DEWMA	270.00	0.0	0.0010	0.02

Table D4-4

	Chart	ARL1	SD	Lambda
1	Ft	221.68	102.4	0.0005
2	at	222.38	101.9	0.0005
3	bt	223.46	100.9	0.0005
4	Ft	223.98	100.4	0.0010
5	at	225.46	99.2	0.0010
6	bt	227.52	97.2	0.0010
7	DEWMA	241.12	83.0	0.0100
8	Ft	242.31	80.6	0.0050
9	at	243.18	79.5	0.0050
10	bt	248.25	72.2	0.0050
11	DEWMA	248.89	72.0	0.0050
12	Ft	249.28	70.5	0.0100
13	at	249.58	70.0	0.0100
14	EWMA	250.81	68.4	0.0050
15	bt	251.25	67.2	0.0100
16	EWMA	251.72	66.6	0.0100
17	DEWMA	251.91	66.3	0.0500
18	DEWMA	255.70	58.8	0.2000
19	EWMA	255.74	58.6	0.2000
20	DEWMA	255.84	58.7	0.1000
21	EWMA	256.21	57.9	0.0500
22	Ft	256.48	57.3	0.0500
23	at	257.14	55.9	0.0500
24	Ft	257.23	55.6	0.2000
25	bt	257.37	55.4	0.0500
26	DEWMA	257.51	55.2	0.3000
27	DEWMA	257.56	55.0	0.5000
28	at	257.62	54.8	0.2000
29	EWMA	257.72	54.6	0.1000
30	Ft	258.02	54.0	0.1000
31	EWMA	258.28	53.5	0.3000
32	Ft	258.33	53.3	0.3000
33	EWMA	258.36	53.3	0.5000
34	Shewhart	258.43	53.2	0.0050
35	bt	258.54	52.8	0.3000
36	bt	258.60	52.8	0.1000
37	bt	258.62	52.8	0.2000
38	at	258.66	52.6	0.1000
39	at	258.70	52.5	0.3000
40	Shewhart	258.70	52.4	0.0500
41	Shewhart	258.90	52.1	0.1000
42	at	259.03	51.8	0.5000
43	Shewhart	259.18	51.5	0.0005
44	Shewhart	259.21	51.4	0.5000
45	Shewhart	259.22	51.3	0.2000
46	Shewhart	259.61	50.4	0.3000
47	Shewhart	259.95	49.7	0.0010
48	Shewhart	260.02	49.4	0.0100
49	bt	260.71	47.9	0.5000
50	EWMA	263.04	42.2	0.0010
51	EWMA	268.66	18.7	0.0005
52	Ft	269.82	6.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-5

Average running length under shift = 0.03

	Chart	ARL1	SD	Lambda	shift
1	Ft	221.61	102.6	0.0005	0.03
2	at	222.16	102.1	0.0005	0.03
3	Ft	223.83	100.5	0.0010	0.03
4	bt	223.98	100.6	0.0005	0.03
5	at	225.17	99.3	0.0010	0.03
6	bt	227.58	97.0	0.0010	0.03
7	DEWMA	240.45	83.8	0.0100	0.03
8	Ft	240.95	82.3	0.0050	0.03
9	at	241.72	81.3	0.0050	0.03
10	bt	247.23	73.6	0.0050	0.03
11	DEWMA	248.55	72.6	0.0050	0.03
12	Ft	248.55	71.5	0.0100	0.03
13	at	248.82	71.1	0.0100	0.03
14	bt	249.44	70.0	0.0100	0.03
15	EWMA	249.86	69.9	0.0050	0.03
16	DEWMA	251.01	67.8	0.0500	0.03
17	EWMA	251.29	67.3	0.0100	0.03
18	DEWMA	253.29	63.5	0.1000	0.03
19	EWMA	254.16	61.8	0.0500	0.03
20	EWMA	254.44	61.1	0.2000	0.03
21	Ft	254.48	61.0	0.0500	0.03
22	DEWMA	255.20	59.7	0.2000	0.03
23	at	255.22	59.6	0.0500	0.03
24	bt	255.39	59.4	0.0500	0.03
25	EWMA	255.63	58.9	0.1000	0.03
26	Ft	255.87	58.4	0.1000	0.03
27	at	256.02	58.1	0.1000	0.03
28	Ft	256.42	57.3	0.2000	0.03
29	DEWMA	256.67	56.9	0.3000	0.03
30	at	257.06	56.0	0.2000	0.03
31	bt	257.20	55.7	0.1000	0.03
32	Shewhart	257.64	54.8	0.0010	0.03
33	bt	257.85	54.4	0.2000	0.03
34	DEWMA	258.11	53.8	0.5000	0.03
35	Shewhart	258.16	53.7	0.0500	0.03
36	Shewhart	258.29	53.3	0.0005	0.03
37	Shewhart	258.33	53.3	0.1000	0.03
38	at	258.35	53.3	0.5000	0.03
39	Shewhart	258.47	53.1	0.0100	0.03
40	Shewhart	258.50	53.0	0.5000	0.03
41	EWMA	258.57	52.8	0.3000	0.03
42	Shewhart	258.61	52.8	0.3000	0.03
43	Shewhart	258.74	52.5	0.2000	0.03
44	EWMA	258.98	52.0	0.5000	0.03
45	Ft	259.03	51.8	0.3000	0.03
46	Shewhart	259.18	51.4	0.0050	0.03
47	at	259.49	50.7	0.3000	0.03
48	bt	259.50	50.7	0.5000	0.03
49	bt	259.83	50.0	0.3000	0.03
50	EWMA	263.16	41.7	0.0010	0.03
51	EWMA	268.35	20.6	0.0005	0.03
52	Ft	269.77	7.7	0.5000	0.03
53	DEWMA	270.00	0.0	0.0005	0.03
54	DEWMA	270.00	0.0	0.0010	0.03

Table D4-5

	Chart	ARL1	SD	Lambda
1	Ft	219.05	104.6	0.0005
2	at	219.25	104.4	0.0005
3	bt	220.68	103.2	0.0005
4	Ft	221.02	103.0	0.0010
5	at	221.81	102.3	0.0010
6	bt	224.48	100.0	0.0010
7	Ft	240.13	83.3	0.0050
8	at	240.92	82.3	0.0050
9	DEWMA	241.44	82.5	0.0100
10	bt	246.38	74.8	0.0050
11	DEWMA	248.70	72.3	0.0050
12	at	249.05	70.8	0.0100
13	Ft	249.20	70.5	0.0100
14	bt	249.46	69.9	0.0100
15	EWMA	249.53	70.4	0.0050
16	EWMA	250.59	68.5	0.0100
17	DEWMA	251.55	66.8	0.0500
18	DEWMA	253.35	63.3	0.1000
19	Ft	254.61	60.8	0.0500
20	EWMA	254.69	60.7	0.0500
21	EWMA	254.73	60.6	0.2000
22	DEWMA	254.88	60.4	0.2000
23	EWMA	255.10	59.9	0.1000
24	at	255.14	59.8	0.0500
25	bt	255.91	58.3	0.0500
26	Ft	256.29	57.6	0.1000
27	at	256.49	57.1	0.1000
28	bt	256.49	57.2	0.1000
29	Ft	257.21	55.7	0.2000
30	DEWMA	257.61	54.9	0.3000
31	Shewhart	257.92	54.2	0.2000
32	EWMA	257.94	54.2	0.5000
33	DEWMA	258.01	54.0	0.5000
34	at	258.01	54.0	0.2000
35	Shewhart	258.17	53.7	0.0050
36	at	258.21	53.6	0.5000
37	Shewhart	258.39	53.2	0.1000
38	Shewhart	258.40	53.2	0.5000
39	Shewhart	258.54	52.9	0.0010
40	Shewhart	258.57	52.9	0.0005
41	EWMA	258.73	52.4	0.3000
42	Ft	258.74	52.3	0.3000
43	bt	258.87	52.2	0.2000
44	Shewhart	258.95	51.9	0.0100
45	Shewhart	259.28	51.2	0.3000
46	Shewhart	259.42	50.9	0.0500
47	bt	259.47	50.8	0.5000
48	at	259.51	50.6	0.3000
49	bt	260.00	49.6	0.3000
50	EWMA	263.18	41.8	0.0010
51	EWMA	268.35	20.6	0.0005
52	Ft	269.72	8.5	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-6

Average running length under shift = 0.04

	Chart	ARL1	SD	Lambda	shift
1	Ft	220.03	103.7	0.0005	0.04
2	at	220.15	103.6	0.0005	0.04
3	Ft	220.88	102.9	0.0010	0.04
4	bt	221.64	102.3	0.0005	0.04
5	at	221.80	102.1	0.0010	0.04
6	bt	224.69	99.6	0.0010	0.04
7	DEWMA	240.40	83.7	0.0100	0.04
8	Ft	241.01	82.1	0.0050	0.04
9	at	241.32	81.7	0.0050	0.04
10	bt	246.15	75.1	0.0050	0.04
11	Ft	247.27	73.4	0.0100	0.04
12	at	247.53	73.0	0.0100	0.04
13	bt	248.36	71.6	0.0100	0.04
14	DEWMA	249.38	71.2	0.0050	0.04
15	EWMA	249.69	69.8	0.0100	0.04
16	EWMA	249.99	69.6	0.0050	0.04
17	DEWMA	250.38	68.7	0.0500	0.04
18	DEWMA	252.98	63.8	0.2000	0.04
19	EWMA	253.33	63.1	0.2000	0.04
20	DEWMA	253.97	62.2	0.1000	0.04
21	EWMA	254.02	62.1	0.0500	0.04
22	Ft	254.12	61.7	0.0500	0.04
23	bt	254.62	60.8	0.0500	0.04
24	at	254.85	60.4	0.0500	0.04
25	DEWMA	255.39	59.4	0.3000	0.04
26	Ft	255.85	58.3	0.3000	0.04
27	Ft	255.86	58.4	0.1000	0.04
28	EWMA	256.07	58.0	0.1000	0.04
29	EWMA	256.15	57.8	0.3000	0.04
30	Ft	256.35	57.5	0.2000	0.04
31	at	256.43	57.2	0.3000	0.04
32	at	256.54	57.0	0.1000	0.04
33	DEWMA	256.74	56.6	0.5000	0.04
34	EWMA	257.03	56.1	0.5000	0.04
35	at	257.12	55.9	0.2000	0.04
36	Shewhart	257.60	54.8	0.0010	0.04
37	bt	257.81	54.4	0.1000	0.04
38	Shewhart	258.01	54.0	0.3000	0.04
39	Shewhart	258.08	53.8	0.0100	0.04
40	Shewhart	258.20	53.7	0.0500	0.04
41	Shewhart	258.20	53.6	0.5000	0.04
42	Shewhart	258.40	53.2	0.0050	0.04
43	Shewhart	258.61	52.8	0.0005	0.04
44	at	258.70	52.5	0.5000	0.04
45	bt	258.72	52.6	0.2000	0.04
46	Shewhart	258.81	52.3	0.2000	0.04
47	bt	259.00	51.9	0.3000	0.04
48	bt	259.29	51.2	0.5000	0.04
49	Shewhart	259.29	51.2	0.1000	0.04
50	EWMA	263.05	42.1	0.0010	0.04
51	EWMA	268.29	21.0	0.0005	0.04
52	Ft	269.82	6.7	0.5000	0.04
53	DEWMA	270.00	0.0	0.0005	0.04
54	DEWMA	270.00	0.0	0.0010	0.04

Table D4-6

	Chart	ARL1	SD	Lambda
1	Ft	219.70	104.0	0.0005
2	at	220.22	103.6	0.0005
3	bt	221.81	102.2	0.0005
4	Ft	221.90	102.1	0.0010
5	at	223.20	101.1	0.0010
6	bt	225.43	99.0	0.0010
7	Ft	239.85	83.6	0.0050
8	DEWMA	240.37	83.8	0.0100
9	at	240.67	82.6	0.0050
10	bt	246.13	75.1	0.0050
11	at	247.82	72.6	0.0100
12	Ft	247.97	72.4	0.0100
13	EWMA	248.72	71.6	0.0050
14	DEWMA	249.04	71.8	0.0050
15	bt	249.04	70.6	0.0100
16	EWMA	250.00	69.3	0.0100
17	DEWMA	251.26	67.2	0.0500
18	EWMA	253.26	63.4	0.0500
19	DEWMA	253.37	63.2	0.1000
20	Ft	253.62	62.7	0.0500
21	at	254.18	61.7	0.0500
22	Ft	254.59	60.8	0.1000
23	bt	254.72	60.7	0.0500
24	DEWMA	254.96	60.2	0.3000
25	EWMA	254.99	60.1	0.2000
26	EWMA	255.14	59.8	0.1000
27	DEWMA	255.19	59.8	0.2000
28	at	255.33	59.4	0.1000
29	bt	256.30	57.6	0.1000
30	Ft	256.75	56.7	0.3000
31	EWMA	257.25	55.6	0.3000
32	at	257.33	55.5	0.3000
33	Ft	257.37	55.5	0.2000
34	DEWMA	257.59	54.9	0.5000
35	Shewhart	257.86	54.4	0.0010
36	at	257.86	54.4	0.2000
37	at	258.14	53.7	0.5000
38	Shewhart	258.15	53.7	0.5000
39	Shewhart	258.15	53.7	0.0500
40	Shewhart	258.20	53.7	0.1000
41	EWMA	258.25	53.5	0.5000
42	Shewhart	258.43	53.1	0.0005
43	Shewhart	258.50	52.9	0.3000
44	Shewhart	258.73	52.4	0.0050
45	Shewhart	258.83	52.2	0.2000
46	Shewhart	259.15	51.5	0.0100
47	bt	259.24	51.4	0.2000
48	bt	259.37	51.1	0.3000
49	bt	259.44	50.9	0.5000
50	EWMA	262.74	43.1	0.0010
51	EWMA	268.45	20.1	0.0005
52	Ft	269.82	6.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-7

Average running length under shift = 0.05

	Chart	ARL1	SD	Lambda	shift
1	Ft	219.38	104.1	0.0005	0.05
2	at	219.86	103.7	0.0005	0.05
3	bt	221.18	102.6	0.0005	0.05
4	Ft	222.30	101.7	0.0010	0.05
5	at	223.57	100.6	0.0010	0.05
6	bt	225.59	98.8	0.0010	0.05
7	DEWMA	238.83	85.7	0.0100	0.05
8	Ft	239.16	84.4	0.0050	0.05
9	at	240.08	83.2	0.0050	0.05
10	bt	245.10	76.5	0.0050	0.05
11	at	246.25	74.7	0.0100	0.05
12	Ft	246.26	74.7	0.0100	0.05
13	bt	247.39	72.9	0.0100	0.05
14	EWMA	248.37	71.8	0.0100	0.05
15	EWMA	248.59	71.7	0.0050	0.05
16	DEWMA	249.28	71.3	0.0050	0.05
17	DEWMA	250.44	68.6	0.0500	0.05
18	DEWMA	251.03	67.3	0.1000	0.05
19	EWMA	252.08	65.3	0.0500	0.05
20	Ft	252.54	64.4	0.0500	0.05
21	Ft	253.10	63.5	0.1000	0.05
22	DEWMA	253.22	63.3	0.2000	0.05
23	at	253.45	62.9	0.0500	0.05
24	EWMA	253.52	62.8	0.1000	0.05
25	EWMA	254.08	61.6	0.2000	0.05
26	at	254.09	61.7	0.1000	0.05
27	bt	254.54	60.9	0.0500	0.05
28	DEWMA	254.91	60.2	0.3000	0.05
29	bt	255.72	58.7	0.1000	0.05
30	EWMA	255.85	58.4	0.3000	0.05
31	DEWMA	256.12	57.9	0.5000	0.05
32	Ft	256.14	57.8	0.2000	0.05
33	Ft	256.24	57.6	0.3000	0.05
34	EWMA	257.02	56.0	0.5000	0.05
35	Shewhart	257.11	55.9	0.5000	0.05
36	at	257.35	55.4	0.2000	0.05
37	at	257.36	55.4	0.3000	0.05
38	Shewhart	257.51	55.1	0.0500	0.05
39	Shewhart	257.70	54.7	0.0100	0.05
40	Shewhart	257.82	54.4	0.0050	0.05
41	Shewhart	257.88	54.3	0.2000	0.05
42	at	257.93	54.2	0.5000	0.05
43	Shewhart	258.05	54.0	0.1000	0.05
44	Shewhart	258.33	53.3	0.0010	0.05
45	Shewhart	258.40	53.1	0.0005	0.05
46	Shewhart	258.82	52.2	0.3000	0.05
47	bt	258.85	52.3	0.2000	0.05
48	bt	259.09	51.6	0.3000	0.05
49	bt	259.80	50.0	0.5000	0.05
50	EWMA	262.79	43.0	0.0010	0.05
51	EWMA	268.57	19.3	0.0005	0.05
52	Ft	269.62	9.8	0.5000	0.05
53	DEWMA	270.00	0.0	0.0005	0.05
54	DEWMA	270.00	0.0	0.0010	0.05

Table D4-7

	Chart	ARL1	SD	Lambda
1	at	218.21	105.1	0.0005
2	Ft	218.27	105.0	0.0005
3	bt	219.57	104.0	0.0005
4	Ft	221.21	102.5	0.0010
5	at	222.65	101.4	0.0010
6	bt	225.29	99.0	0.0010
7	DEWMA	239.09	85.4	0.0100
8	Ft	239.48	83.9	0.0050
9	at	240.16	83.1	0.0050
10	bt	245.38	76.1	0.0050
11	Ft	245.96	75.2	0.0100
12	at	246.17	74.9	0.0100
13	bt	247.32	73.1	0.0100
14	EWMA	248.53	71.8	0.0050
15	EWMA	248.67	71.4	0.0100
16	DEWMA	249.20	70.4	0.0500
17	DEWMA	249.23	71.5	0.0050
18	DEWMA	251.52	66.5	0.1000
19	EWMA	252.05	65.4	0.0500
20	Ft	252.09	65.2	0.0500
21	at	252.77	64.1	0.0500
22	EWMA	253.24	63.2	0.2000
23	bt	253.58	62.7	0.0500
24	DEWMA	253.63	62.6	0.2000
25	EWMA	254.05	61.9	0.1000
26	Ft	254.91	60.3	0.1000
27	DEWMA	255.18	59.7	0.3000
28	Ft	255.41	59.3	0.2000
29	at	255.74	58.7	0.1000
30	DEWMA	255.90	58.3	0.5000
31	at	256.20	57.8	0.2000
32	bt	256.75	56.7	0.1000
33	Ft	256.91	56.4	0.3000
34	EWMA	257.09	55.9	0.5000
35	EWMA	257.33	55.5	0.3000
36	at	257.48	55.2	0.3000
37	at	257.58	54.9	0.5000
38	Shewhart	257.62	54.8	0.2000
39	Shewhart	257.65	54.8	0.0005
40	Shewhart	257.74	54.6	0.5000
41	Shewhart	257.93	54.2	0.0100
42	Shewhart	258.01	54.0	0.3000
43	Shewhart	258.18	53.7	0.1000
44	Shewhart	258.24	53.5	0.0010
45	Shewhart	258.26	53.5	0.0050
46	Shewhart	258.35	53.4	0.0500
47	bt	258.44	53.2	0.2000
48	bt	259.02	51.9	0.5000
49	bt	259.03	51.9	0.3000
50	EWMA	263.63	40.4	0.0010
51	EWMA	268.35	20.7	0.0005
52	Ft	269.64	9.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-8

Average running length under shift = 0.06

	Chart	ARL1	SD	Lambda	shift
1	Ft	218.73	104.6	0.0005	0.06
2	at	219.56	104.0	0.0005	0.06
3	bt	220.71	103.0	0.0005	0.06
4	Ft	220.73	103.0	0.0010	0.06
5	at	222.07	101.9	0.0010	0.06
6	bt	224.26	99.9	0.0010	0.06
7	Ft	237.80	85.8	0.0050	0.06
8	at	238.92	84.5	0.0050	0.06
9	DEWMA	240.34	83.9	0.0100	0.06
10	bt	244.05	77.9	0.0050	0.06
11	Ft	245.58	75.7	0.0100	0.06
12	at	245.82	75.3	0.0100	0.06
13	bt	246.94	73.6	0.0100	0.06
14	EWMA	247.92	72.7	0.0050	0.06
15	DEWMA	248.57	72.5	0.0050	0.06
16	DEWMA	248.88	71.0	0.0500	0.06
17	EWMA	248.96	70.9	0.0100	0.06
18	DEWMA	250.57	67.7	0.2000	0.06
19	EWMA	250.78	67.3	0.2000	0.06
20	EWMA	251.48	66.2	0.0500	0.06
21	DEWMA	251.95	65.6	0.1000	0.06
22	Ft	252.30	64.8	0.0500	0.06
23	at	252.94	63.7	0.0500	0.06
24	EWMA	253.15	63.3	0.1000	0.06
25	bt	253.29	63.1	0.0500	0.06
26	DEWMA	253.40	63.0	0.3000	0.06
27	Ft	253.80	62.2	0.1000	0.06
28	DEWMA	254.10	61.7	0.5000	0.06
29	Ft	254.20	61.5	0.2000	0.06
30	EWMA	254.57	60.8	0.3000	0.06
31	at	254.69	60.5	0.1000	0.06
32	at	254.72	60.5	0.2000	0.06
33	EWMA	255.78	58.6	0.5000	0.06
34	bt	256.17	57.9	0.1000	0.06
35	Ft	256.24	57.6	0.3000	0.06
36	at	256.47	57.2	0.3000	0.06
37	at	257.18	55.8	0.5000	0.06
38	Shewhart	257.30	55.4	0.0500	0.06
39	Shewhart	257.35	55.5	0.0050	0.06
40	Shewhart	257.46	55.2	0.1000	0.06
41	Shewhart	257.70	54.7	0.0005	0.06
42	Shewhart	257.72	54.6	0.2000	0.06
43	Shewhart	257.86	54.3	0.5000	0.06
44	Shewhart	257.98	54.1	0.3000	0.06
45	bt	257.99	54.2	0.2000	0.06
46	bt	258.04	53.9	0.3000	0.06
47	Shewhart	258.56	52.7	0.0100	0.06
48	Shewhart	258.64	52.7	0.0010	0.06
49	bt	260.52	48.3	0.5000	0.06
50	EWMA	261.99	45.0	0.0010	0.06
51	EWMA	268.49	19.8	0.0005	0.06
52	Ft	269.82	6.6	0.5000	0.06
53	DEWMA	270.00	0.0	0.0005	0.06
54	DEWMA	270.00	0.0	0.0010	0.06

Table D4-8

	Chart	ARL1	SD	Lambda
1	at	219.87	103.7	0.0005
2	Ft	219.96	103.7	0.0005
3	bt	221.53	102.4	0.0005
4	Ft	222.03	101.9	0.0010
5	at	223.28	100.8	0.0010
6	bt	225.64	98.7	0.0010
7	Ft	238.62	85.0	0.0050
8	at	239.52	83.9	0.0050
9	DEWMA	241.10	82.9	0.0100
10	bt	244.44	77.4	0.0050
11	Ft	246.33	74.6	0.0100
12	at	246.34	74.5	0.0100
13	bt	247.36	73.0	0.0100
14	EWMA	248.14	72.4	0.0050
15	DEWMA	248.37	72.7	0.0050
16	EWMA	249.02	70.8	0.0100
17	DEWMA	249.28	70.3	0.0500
18	DEWMA	250.10	68.5	0.1000
19	EWMA	250.51	67.9	0.0500
20	Ft	250.83	67.3	0.0500
21	at	251.08	66.9	0.0500
22	EWMA	252.29	64.8	0.1000
23	bt	252.46	64.6	0.0500
24	Ft	252.86	63.8	0.1000
25	EWMA	252.88	63.9	0.2000
26	DEWMA	252.99	63.7	0.2000
27	DEWMA	253.20	63.4	0.3000
28	at	253.69	62.3	0.1000
29	Ft	255.54	59.1	0.2000
30	bt	255.76	58.6	0.1000
31	Ft	255.88	58.4	0.3000
32	EWMA	255.98	58.2	0.3000
33	DEWMA	256.08	58.0	0.5000
34	at	256.10	58.0	0.2000
35	EWMA	256.56	57.0	0.5000
36	at	256.58	57.0	0.3000
37	Shewhart	256.73	56.7	0.0005
38	Shewhart	256.98	56.2	0.0100
39	Shewhart	257.26	55.6	0.0500
40	at	257.42	55.3	0.5000
41	Shewhart	257.42	55.3	0.3000
42	Shewhart	257.58	55.0	0.1000
43	Shewhart	257.71	54.7	0.5000
44	Shewhart	257.78	54.5	0.0010
45	Shewhart	257.93	54.2	0.0050
46	Shewhart	258.03	53.9	0.2000
47	bt	258.20	53.7	0.2000
48	bt	258.40	53.3	0.3000
49	bt	259.39	51.0	0.5000
50	EWMA	263.07	42.0	0.0010
51	EWMA	268.02	22.7	0.0005
52	Ft	269.82	6.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-9

Average running length under shift = 0.07

	Chart	ARL1	SD	Lambda	shift
1	Ft	215.67	106.9	0.0005	0.07
2	at	215.82	106.8	0.0005	0.07
3	bt	217.12	105.8	0.0005	0.07
4	Ft	217.66	105.5	0.0010	0.07
5	at	218.55	104.8	0.0010	0.07
6	bt	220.83	102.9	0.0010	0.07
7	Ft	235.96	87.9	0.0050	0.07
8	at	236.94	86.8	0.0050	0.07
9	DEWMA	240.64	83.4	0.0100	0.07
10	bt	242.02	80.5	0.0050	0.07
11	at	244.67	76.9	0.0100	0.07
12	Ft	244.71	76.8	0.0100	0.07
13	bt	244.93	76.3	0.0100	0.07
14	EWMA	247.00	74.1	0.0050	0.07
15	EWMA	247.61	73.0	0.0100	0.07
16	DEWMA	248.32	72.8	0.0050	0.07
17	DEWMA	248.38	71.2	0.1000	0.07
18	DEWMA	248.55	71.4	0.0500	0.07
19	EWMA	248.83	70.3	0.0500	0.07
20	Ft	249.47	69.3	0.0500	0.07
21	DEWMA	249.49	69.4	0.2000	0.07
22	EWMA	249.88	68.8	0.2000	0.07
23	at	250.12	68.2	0.0500	0.07
24	EWMA	250.29	68.1	0.1000	0.07
25	bt	251.29	66.5	0.0500	0.07
26	Ft	251.41	66.3	0.1000	0.07
27	at	252.29	64.9	0.1000	0.07
28	DEWMA	253.20	63.2	0.3000	0.07
29	bt	253.73	62.4	0.1000	0.07
30	Ft	254.08	61.8	0.2000	0.07
31	DEWMA	254.82	60.3	0.5000	0.07
32	at	255.03	60.0	0.2000	0.07
33	EWMA	255.20	59.6	0.5000	0.07
34	EWMA	256.04	58.0	0.3000	0.07
35	Shewhart	256.30	57.6	0.2000	0.07
36	at	256.41	57.3	0.5000	0.07
37	Ft	256.52	57.0	0.3000	0.07
38	Shewhart	256.72	56.7	0.0050	0.07
39	Shewhart	256.82	56.6	0.0005	0.07
40	Shewhart	256.85	56.4	0.5000	0.07
41	at	256.97	56.2	0.3000	0.07
42	Shewhart	257.05	56.0	0.1000	0.07
43	Shewhart	257.20	55.7	0.0010	0.07
44	Shewhart	257.32	55.4	0.0100	0.07
45	Shewhart	257.64	54.8	0.0500	0.07
46	Shewhart	257.71	54.6	0.3000	0.07
47	bt	257.93	54.3	0.2000	0.07
48	bt	259.18	51.5	0.5000	0.07
49	bt	259.41	51.0	0.3000	0.07
50	EWMA	262.17	44.5	0.0010	0.07
51	EWMA	268.10	22.1	0.0005	0.07
52	Ft	269.69	8.8	0.5000	0.07
53	DEWMA	270.00	0.0	0.0005	0.07
54	DEWMA	270.00	0.0	0.0010	0.07

Table D4-9

	Chart	ARL1	SD	Lambda
1	Ft	216.02	106.7	0.0005
2	at	216.54	106.3	0.0005
3	bt	218.03	105.1	0.0005
4	Ft	220.05	103.4	0.0010
5	at	221.30	102.4	0.0010
6	bt	223.81	100.2	0.0010
7	Ft	236.83	86.9	0.0050
8	at	237.53	86.1	0.0050
9	DEWMA	240.12	84.0	0.0100
10	bt	242.61	79.7	0.0050
11	Ft	244.11	77.5	0.0100
12	at	244.37	77.2	0.0100
13	bt	245.56	75.4	0.0100
14	EWMA	247.67	73.1	0.0050
15	EWMA	247.84	72.5	0.0100
16	DEWMA	248.23	71.8	0.0500
17	DEWMA	249.05	71.7	0.0050
18	EWMA	249.50	69.4	0.0500
19	DEWMA	249.71	69.2	0.1000
20	EWMA	250.09	68.4	0.2000
21	Ft	250.76	67.3	0.0500
22	DEWMA	250.90	67.2	0.2000
23	at	251.31	66.4	0.0500
24	bt	251.64	65.9	0.0500
25	EWMA	252.06	65.1	0.1000
26	Ft	252.23	64.9	0.1000
27	DEWMA	252.47	64.5	0.3000
28	at	253.24	63.1	0.1000
29	EWMA	253.58	62.6	0.3000
30	Ft	253.63	62.5	0.2000
31	DEWMA	254.02	61.8	0.5000
32	at	254.10	61.7	0.2000
33	Ft	254.98	60.2	0.3000
34	at	255.30	59.6	0.3000
35	bt	255.44	59.3	0.1000
36	EWMA	255.52	59.0	0.5000
37	Shewhart	255.86	58.4	0.3000
38	Shewhart	256.38	57.5	0.0050
39	Shewhart	256.43	57.2	0.0005
40	Shewhart	256.61	56.9	0.5000
41	Shewhart	256.73	56.7	0.2000
42	at	256.78	56.5	0.5000
43	Shewhart	257.17	55.7	0.0100
44	Shewhart	257.22	55.7	0.0500
45	Shewhart	257.46	55.1	0.1000
46	Shewhart	257.62	54.9	0.0010
47	bt	257.88	54.5	0.2000
48	bt	258.04	54.1	0.3000
49	bt	259.33	51.1	0.5000
50	EWMA	262.92	42.4	0.0010
51	EWMA	268.08	22.2	0.0005
52	Ft	269.87	5.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-10

Average running length under shift = 0.08

	Chart	ARL1	SD	Lambda	shift
1	Ft	216.33	106.4	0.0005	0.08
2	at	216.61	106.1	0.0005	0.08
3	bt	218.11	104.9	0.0005	0.08
4	Ft	218.50	104.7	0.0010	0.08
5	at	219.61	103.8	0.0010	0.08
6	bt	221.96	101.8	0.0010	0.08
7	Ft	235.46	88.4	0.0050	0.08
8	at	236.21	87.6	0.0050	0.08
9	DEWMA	239.45	84.8	0.0100	0.08
10	bt	241.77	80.7	0.0050	0.08
11	Ft	243.02	79.0	0.0100	0.08
12	at	243.27	78.7	0.0100	0.08
13	bt	244.48	76.9	0.0100	0.08
14	EWMA	246.21	75.2	0.0050	0.08
15	EWMA	246.44	74.5	0.0100	0.08
16	DEWMA	247.46	72.8	0.0500	0.08
17	EWMA	247.73	72.1	0.0500	0.08
18	Ft	247.83	71.9	0.0500	0.08
19	at	248.17	71.4	0.0500	0.08
20	DEWMA	248.63	70.8	0.1000	0.08
21	DEWMA	248.64	72.4	0.0050	0.08
22	bt	249.83	68.9	0.0500	0.08
23	DEWMA	250.08	68.5	0.3000	0.08
24	EWMA	250.47	67.9	0.2000	0.08
25	EWMA	250.47	67.7	0.1000	0.08
26	Ft	250.48	67.8	0.1000	0.08
27	DEWMA	250.70	67.5	0.2000	0.08
28	at	251.33	66.4	0.1000	0.08
29	EWMA	253.24	63.2	0.3000	0.08
30	bt	253.78	62.3	0.1000	0.08
31	DEWMA	253.96	61.9	0.5000	0.08
32	Ft	254.24	61.5	0.2000	0.08
33	Ft	254.36	61.2	0.3000	0.08
34	at	255.00	60.1	0.3000	0.08
35	at	255.07	59.9	0.2000	0.08
36	EWMA	255.29	59.5	0.5000	0.08
37	Shewhart	256.25	57.7	0.0010	0.08
38	at	256.28	57.6	0.5000	0.08
39	Shewhart	256.57	57.0	0.5000	0.08
40	Shewhart	256.68	56.7	0.0500	0.08
41	Shewhart	256.84	56.4	0.0005	0.08
42	Shewhart	256.92	56.4	0.1000	0.08
43	Shewhart	256.94	56.2	0.3000	0.08
44	Shewhart	257.36	55.4	0.2000	0.08
45	Shewhart	257.37	55.4	0.0100	0.08
46	Shewhart	257.42	55.3	0.0050	0.08
47	bt	258.32	53.5	0.2000	0.08
48	bt	259.03	51.9	0.3000	0.08
49	bt	259.12	51.7	0.5000	0.08
50	EWMA	261.97	45.1	0.0010	0.08
51	EWMA	268.18	21.7	0.0005	0.08
52	Ft	269.74	8.2	0.5000	0.08
53	DEWMA	270.00	0.0	0.0005	0.08
54	DEWMA	270.00	0.0	0.0010	0.08

Table D4-10

	Chart	ARL1	SD	Lambda
1	Ft	216.44	106.4	0.0005
2	at	216.87	106.0	0.0005
3	bt	218.21	105.0	0.0005
4	Ft	218.23	104.7	0.0010
5	at	219.50	103.7	0.0010
6	bt	222.02	101.7	0.0010
7	Ft	236.09	87.6	0.0050
8	at	237.06	86.6	0.0050
9	DEWMA	238.77	85.7	0.0100
10	bt	242.38	79.9	0.0050
11	Ft	242.89	79.1	0.0100
12	at	243.07	78.9	0.0100
13	bt	243.91	77.6	0.0100
14	DEWMA	246.17	74.8	0.0500
15	EWMA	246.52	74.4	0.0100
16	EWMA	247.14	72.9	0.0500
17	EWMA	247.26	73.7	0.0050
18	DEWMA	247.27	72.9	0.1000
19	Ft	247.70	72.0	0.0500
20	at	248.29	71.1	0.0500
21	DEWMA	248.55	72.5	0.0050
22	EWMA	248.67	70.6	0.2000
23	EWMA	249.04	70.1	0.1000
24	DEWMA	249.12	69.9	0.2000
25	Ft	249.55	69.3	0.1000
26	bt	249.59	69.3	0.0500
27	at	250.47	67.9	0.1000
28	DEWMA	251.01	66.9	0.3000
29	Ft	252.68	64.3	0.2000
30	DEWMA	253.22	63.3	0.5000
31	at	253.29	63.1	0.2000
32	EWMA	253.40	62.9	0.3000
33	bt	253.83	62.3	0.1000
34	EWMA	254.20	61.6	0.5000
35	Ft	254.74	60.5	0.3000
36	at	255.40	59.2	0.3000
37	Shewhart	255.60	58.9	0.0050
38	Shewhart	255.75	58.6	0.0010
39	Shewhart	255.75	58.6	0.2000
40	Shewhart	255.92	58.4	0.1000
41	Shewhart	256.50	57.0	0.5000
42	Shewhart	256.58	57.0	0.0500
43	Shewhart	256.75	56.6	0.0005
44	at	256.91	56.4	0.5000
45	bt	256.91	56.4	0.2000
46	Shewhart	257.03	56.1	0.3000
47	Shewhart	257.05	56.1	0.0100
48	bt	258.67	52.7	0.3000
49	bt	259.96	49.7	0.5000
50	EWMA	262.88	42.5	0.0010
51	EWMA	268.17	21.7	0.0005
52	Ft	269.77	7.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-11

Average running length under shift = 0.09

	Chart	ARL1	SD	Lambda	shift
1	Ft	214.97	107.3	0.0005	0.09
2	at	215.19	107.2	0.0005	0.09
3	bt	216.41	106.2	0.0005	0.09
4	Ft	217.01	105.6	0.0010	0.09
5	at	218.88	104.2	0.0010	0.09
6	bt	220.85	102.5	0.0010	0.09
7	Ft	234.37	89.4	0.0050	0.09
8	at	235.44	88.3	0.0050	0.09
9	DEWMA	238.24	86.3	0.0100	0.09
10	bt	239.96	82.8	0.0050	0.09
11	at	240.67	81.9	0.0100	0.09
12	Ft	240.91	81.6	0.0100	0.09
13	bt	241.30	80.9	0.0100	0.09
14	EWMA	244.84	76.8	0.0100	0.09
15	DEWMA	245.22	75.9	0.0500	0.09
16	EWMA	245.66	75.8	0.0050	0.09
17	DEWMA	245.70	75.0	0.1000	0.09
18	EWMA	246.03	74.4	0.0500	0.09
19	Ft	246.44	73.8	0.0500	0.09
20	at	246.98	73.0	0.0500	0.09
21	DEWMA	247.78	71.9	0.2000	0.09
22	EWMA	248.36	71.0	0.2000	0.09
23	bt	248.57	70.7	0.0500	0.09
24	DEWMA	248.66	72.3	0.0050	0.09
25	EWMA	249.05	70.1	0.1000	0.09
26	Ft	249.81	68.9	0.1000	0.09
27	DEWMA	250.74	67.3	0.3000	0.09
28	at	251.25	66.6	0.1000	0.09
29	DEWMA	251.45	66.2	0.5000	0.09
30	Ft	252.03	65.3	0.2000	0.09
31	at	253.12	63.5	0.2000	0.09
32	EWMA	253.32	63.1	0.3000	0.09
33	bt	253.81	62.3	0.1000	0.09
34	Ft	254.22	61.6	0.3000	0.09
35	EWMA	254.29	61.3	0.5000	0.09
36	at	254.80	60.5	0.3000	0.09
37	at	255.86	58.4	0.5000	0.09
38	Shewhart	256.27	57.5	0.2000	0.09
39	Shewhart	256.32	57.5	0.0005	0.09
40	Shewhart	256.40	57.4	0.3000	0.09
41	Shewhart	256.47	57.2	0.0100	0.09
42	Shewhart	256.53	57.1	0.0050	0.09
43	Shewhart	256.55	57.1	0.5000	0.09
44	Shewhart	256.59	57.0	0.0500	0.09
45	Shewhart	256.74	56.7	0.0010	0.09
46	Shewhart	256.88	56.4	0.1000	0.09
47	bt	257.44	55.4	0.2000	0.09
48	bt	258.55	53.0	0.3000	0.09
49	bt	258.86	52.3	0.5000	0.09
50	EWMA	262.78	42.8	0.0010	0.09
51	EWMA	267.98	22.8	0.0005	0.09
52	Ft	269.64	9.7	0.5000	0.09
53	DEWMA	270.00	0.0	0.0005	0.09
54	DEWMA	270.00	0.0	0.0010	0.09

Table D4-11

	Chart	ARL1	SD	Lambda
1	Ft	215.92	106.5	0.0010
2	Ft	217.09	105.8	0.0005
3	at	217.15	105.6	0.0010
4	at	217.71	105.3	0.0005
5	bt	218.77	104.5	0.0005
6	bt	219.60	103.6	0.0010
7	Ft	233.53	90.3	0.0050
8	at	234.43	89.4	0.0050
9	DEWMA	239.56	84.6	0.0100
10	bt	240.58	82.1	0.0050
11	at	241.48	81.0	0.0100
12	Ft	241.70	80.7	0.0100
13	bt	243.39	78.3	0.0100
14	DEWMA	244.27	77.3	0.0500
15	EWMA	245.13	76.7	0.0050
16	EWMA	245.13	75.7	0.0500
17	EWMA	245.32	76.1	0.0100
18	Ft	246.22	74.1	0.0500
19	DEWMA	246.47	73.8	0.1000
20	at	246.91	73.1	0.0500
21	EWMA	246.91	73.2	0.2000
22	DEWMA	247.21	74.5	0.0050
23	DEWMA	247.69	72.0	0.2000
24	DEWMA	248.45	70.9	0.3000
25	EWMA	249.00	69.9	0.1000
26	Ft	249.36	69.5	0.1000
27	bt	249.37	69.5	0.0500
28	at	249.63	69.0	0.1000
29	EWMA	251.96	65.4	0.3000
30	Ft	252.23	65.0	0.2000
31	bt	252.43	64.7	0.1000
32	at	252.75	64.1	0.2000
33	DEWMA	253.31	63.1	0.5000
34	at	254.96	60.1	0.3000
35	Ft	254.99	60.1	0.3000
36	EWMA	255.32	59.4	0.5000
37	Shewhart	255.68	58.7	0.0005
38	Shewhart	255.73	58.7	0.3000
39	Shewhart	256.00	58.2	0.1000
40	Shewhart	256.13	57.9	0.0100
41	at	256.34	57.4	0.5000
42	Shewhart	256.35	57.4	0.2000
43	Shewhart	256.36	57.3	0.0500
44	Shewhart	256.44	57.3	0.0010
45	Shewhart	256.56	57.0	0.5000
46	Shewhart	257.26	55.6	0.0050
47	bt	257.57	55.0	0.2000
48	bt	258.43	53.2	0.3000
49	bt	260.03	49.4	0.5000
50	EWMA	262.04	44.8	0.0010
51	EWMA	268.19	21.6	0.0005
52	Ft	269.67	9.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-12

Average running length under shift = 0.1

	Chart	ARL1	SD	Lambda	shift
1	Ft	216.11	106.4	0.0005	0.1
2	at	216.48	106.1	0.0005	0.1
3	bt	217.68	105.2	0.0005	0.1
4	Ft	217.98	104.9	0.0010	0.1
5	at	219.00	104.1	0.0010	0.1
6	bt	221.66	101.9	0.0010	0.1
7	Ft	233.86	90.0	0.0050	0.1
8	at	235.05	88.7	0.0050	0.1
9	bt	238.83	84.1	0.0050	0.1
10	DEWMA	240.06	84.1	0.0100	0.1
11	Ft	240.86	81.5	0.0100	0.1
12	at	241.03	81.3	0.0100	0.1
13	bt	241.58	80.5	0.0100	0.1
14	EWMA	243.92	77.2	0.0500	0.1
15	DEWMA	244.61	76.3	0.1000	0.1
16	Ft	244.75	76.1	0.0500	0.1
17	DEWMA	244.85	76.4	0.0500	0.1
18	at	245.10	75.6	0.0500	0.1
19	EWMA	245.13	76.2	0.0100	0.1
20	EWMA	245.40	76.2	0.0050	0.1
21	EWMA	246.27	73.9	0.1000	0.1
22	bt	246.98	73.1	0.0500	0.1
23	DEWMA	247.09	72.9	0.2000	0.1
24	Ft	247.41	72.4	0.1000	0.1
25	EWMA	247.41	72.5	0.2000	0.1
26	DEWMA	247.83	73.5	0.0050	0.1
27	DEWMA	248.09	71.5	0.3000	0.1
28	at	248.38	70.9	0.1000	0.1
29	EWMA	251.75	65.7	0.3000	0.1
30	DEWMA	252.23	65.0	0.5000	0.1
31	bt	252.38	64.8	0.1000	0.1
32	at	252.56	64.5	0.2000	0.1
33	Ft	252.90	63.9	0.2000	0.1
34	Ft	253.49	62.8	0.3000	0.1
35	EWMA	253.65	62.5	0.5000	0.1
36	at	253.91	62.0	0.3000	0.1
37	Shewhart	255.14	59.8	0.0005	0.1
38	Shewhart	255.46	59.1	0.0500	0.1
39	Shewhart	255.58	59.0	0.3000	0.1
40	at	255.71	58.7	0.5000	0.1
41	Shewhart	255.86	58.4	0.0100	0.1
42	Shewhart	255.93	58.3	0.1000	0.1
43	Shewhart	255.93	58.2	0.5000	0.1
44	Shewhart	256.10	57.9	0.0050	0.1
45	Shewhart	256.29	57.6	0.0010	0.1
46	Shewhart	256.53	57.0	0.2000	0.1
47	bt	257.13	56.0	0.2000	0.1
48	bt	257.85	54.5	0.3000	0.1
49	bt	259.28	51.3	0.5000	0.1
50	EWMA	262.25	44.3	0.0010	0.1
51	EWMA	267.77	24.0	0.0005	0.1
52	Ft	269.82	6.8	0.5000	0.1
53	DEWMA	270.00	0.0	0.0005	0.1
54	DEWMA	270.00	0.0	0.0010	0.1

Table D4-12

	Chart	ARL1	SD	Lambda
1	Ft	215.99	106.5	0.0005
2	Ft	216.72	105.9	0.0010
3	at	216.74	105.9	0.0005
4	at	217.21	105.5	0.0010
5	bt	218.39	104.7	0.0005
6	bt	220.13	103.2	0.0010
7	Ft	234.52	89.3	0.0050
8	at	235.59	88.1	0.0050
9	DEWMA	238.93	85.4	0.0100
10	at	239.96	82.6	0.0100
11	Ft	240.00	82.6	0.0100
12	bt	240.55	82.1	0.0050
13	bt	241.05	81.2	0.0100
14	DEWMA	242.91	79.0	0.0500
15	EWMA	243.70	77.5	0.0500
16	DEWMA	243.98	77.1	0.1000
17	EWMA	244.05	77.7	0.0100
18	Ft	244.50	76.4	0.0500
19	at	245.32	75.3	0.0500
20	EWMA	245.65	75.8	0.0050
21	DEWMA	245.74	74.8	0.2000
22	EWMA	246.00	74.4	0.2000
23	EWMA	246.56	73.6	0.1000
24	Ft	246.94	73.1	0.1000
25	at	247.73	71.9	0.1000
26	bt	247.83	71.9	0.0500
27	DEWMA	248.55	72.4	0.0050
28	DEWMA	249.54	69.2	0.3000
29	DEWMA	250.58	67.6	0.5000
30	EWMA	251.50	66.1	0.3000
31	at	251.70	65.9	0.2000
32	Ft	251.86	65.7	0.2000
33	EWMA	252.05	65.2	0.5000
34	bt	252.83	64.0	0.1000
35	Ft	253.18	63.4	0.3000
36	at	253.58	62.6	0.3000
37	Shewhart	255.15	59.7	0.1000
38	at	255.37	59.4	0.5000
39	Shewhart	255.41	59.3	0.5000
40	Shewhart	255.55	59.1	0.0100
41	Shewhart	255.70	58.8	0.3000
42	Shewhart	255.82	58.5	0.0010
43	Shewhart	255.93	58.3	0.0050
44	Shewhart	255.99	58.2	0.0005
45	Shewhart	256.44	57.2	0.0500
46	Shewhart	256.55	57.1	0.2000
47	bt	258.45	53.2	0.2000
48	bt	258.62	52.9	0.3000
49	bt	259.92	49.9	0.5000
50	EWMA	260.90	47.9	0.0010
51	EWMA	267.82	23.6	0.0005
52	Ft	269.82	6.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-13

Average running length under shift = 0.11

	Chart	ARL1	SD	Lambda	shift
1	Ft	212.11	109.2	0.0005	0.11
2	at	212.29	109.1	0.0005	0.11
3	bt	213.88	107.9	0.0005	0.11
4	Ft	216.31	106.1	0.0010	0.11
5	at	217.57	105.1	0.0010	0.11
6	bt	219.41	103.6	0.0010	0.11
7	Ft	231.88	91.9	0.0050	0.11
8	at	232.73	91.0	0.0050	0.11
9	bt	236.71	86.5	0.0050	0.11
10	Ft	238.15	84.7	0.0100	0.11
11	at	238.80	83.9	0.0100	0.11
12	DEWMA	239.47	84.8	0.0100	0.11
13	bt	239.68	82.7	0.0100	0.11
14	EWMA	242.89	79.1	0.0100	0.11
15	EWMA	243.23	78.0	0.0500	0.11
16	EWMA	243.55	78.6	0.0050	0.11
17	DEWMA	243.80	77.4	0.1000	0.11
18	DEWMA	243.88	77.7	0.0500	0.11
19	Ft	243.91	77.1	0.0500	0.11
20	at	244.61	76.2	0.0500	0.11
21	DEWMA	244.61	76.3	0.2000	0.11
22	EWMA	244.94	75.9	0.2000	0.11
23	EWMA	245.43	75.0	0.1000	0.11
24	bt	246.49	73.7	0.0500	0.11
25	DEWMA	246.91	73.1	0.3000	0.11
26	Ft	246.92	73.0	0.1000	0.11
27	at	247.89	71.6	0.1000	0.11
28	DEWMA	248.70	72.2	0.0050	0.11
29	DEWMA	249.67	69.0	0.5000	0.11
30	EWMA	249.84	68.8	0.3000	0.11
31	Ft	249.88	68.8	0.2000	0.11
32	at	249.90	68.7	0.2000	0.11
33	Ft	251.91	65.6	0.3000	0.11
34	at	252.12	65.2	0.3000	0.11
35	EWMA	252.35	64.7	0.5000	0.11
36	bt	252.87	64.0	0.1000	0.11
37	at	254.09	61.6	0.5000	0.11
38	Shewhart	254.18	61.5	0.3000	0.11
39	Shewhart	254.70	60.7	0.0050	0.11
40	Shewhart	254.86	60.2	0.5000	0.11
41	Shewhart	254.90	60.2	0.0005	0.11
42	Shewhart	255.06	59.9	0.2000	0.11
43	Shewhart	255.25	59.6	0.0500	0.11
44	Shewhart	255.54	59.0	0.0100	0.11
45	Shewhart	255.91	58.3	0.1000	0.11
46	Shewhart	256.22	57.7	0.0010	0.11
47	bt	256.65	57.1	0.2000	0.11
48	bt	257.40	55.5	0.3000	0.11
49	bt	259.11	51.7	0.5000	0.11
50	EWMA	261.96	45.0	0.0010	0.11
51	EWMA	267.81	23.7	0.0005	0.11
52	Ft	269.82	6.9	0.5000	0.11
53	DEWMA	270.00	0.0	0.0005	0.11
54	DEWMA	270.00	0.0	0.0010	0.11

Table D4-13

	Chart	ARL1	SD	Lambda
1	Ft	214.36	107.6	0.0005
2	at	214.55	107.5	0.0005
3	Ft	216.05	106.3	0.0010
4	bt	216.10	106.3	0.0005
5	at	217.12	105.5	0.0010
6	bt	219.49	103.6	0.0010
7	Ft	232.23	91.7	0.0050
8	at	233.06	90.8	0.0050
9	bt	237.40	85.9	0.0050
10	DEWMA	239.47	84.8	0.0100
11	Ft	239.71	82.8	0.0100
12	at	239.92	82.6	0.0100
13	bt	239.94	82.4	0.0100
14	EWMA	241.46	80.2	0.0500
15	Ft	242.05	79.5	0.0500
16	at	242.45	79.0	0.0500
17	DEWMA	243.03	78.4	0.1000
18	EWMA	243.29	79.1	0.0050
19	DEWMA	243.44	78.2	0.0500
20	EWMA	244.39	77.2	0.0100
21	DEWMA	244.93	75.8	0.2000
22	EWMA	245.17	75.5	0.1000
23	bt	245.95	74.5	0.0500
24	Ft	245.95	74.5	0.1000
25	EWMA	245.97	74.5	0.2000
26	DEWMA	246.17	74.2	0.3000
27	at	247.16	72.8	0.1000
28	DEWMA	247.46	74.1	0.0050
29	EWMA	249.60	69.2	0.3000
30	Ft	251.08	66.9	0.2000
31	DEWMA	251.15	66.7	0.5000
32	at	251.58	66.1	0.2000
33	bt	251.92	65.6	0.1000
34	Ft	252.60	64.4	0.3000
35	at	252.86	63.9	0.3000
36	EWMA	253.30	63.1	0.5000
37	Shewhart	254.88	60.3	0.0500
38	at	254.93	60.1	0.5000
39	Shewhart	255.35	59.4	0.2000
40	Shewhart	255.37	59.4	0.0100
41	Shewhart	255.51	59.1	0.0005
42	Shewhart	255.59	58.9	0.1000
43	Shewhart	255.79	58.6	0.5000
44	Shewhart	255.86	58.4	0.0010
45	Shewhart	256.17	57.8	0.3000
46	Shewhart	257.08	55.9	0.0050
47	bt	257.27	55.8	0.2000
48	bt	258.26	53.6	0.3000
49	bt	260.68	48.0	0.5000
50	EWMA	262.24	44.2	0.0010
51	EWMA	267.90	23.1	0.0005
52	Ft	269.69	8.9	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-14

Average running length under shift = 0.12

	Chart	ARL1	SD	Lambda	shift
1	Ft	212.20	109.1	0.0005	0.12
2	at	212.97	108.6	0.0005	0.12
3	bt	214.03	107.8	0.0005	0.12
4	Ft	214.31	107.5	0.0010	0.12
5	at	215.28	106.7	0.0010	0.12
6	bt	217.53	105.0	0.0010	0.12
7	Ft	230.56	93.1	0.0050	0.12
8	at	231.54	92.1	0.0050	0.12
9	bt	236.30	86.8	0.0050	0.12
10	Ft	236.42	86.6	0.0100	0.12
11	at	236.58	86.4	0.0100	0.12
12	bt	236.70	86.1	0.0100	0.12
13	DEWMA	237.75	86.8	0.0100	0.12
14	EWMA	239.49	82.6	0.0500	0.12
15	DEWMA	239.99	82.2	0.1000	0.12
16	Ft	240.52	81.4	0.0500	0.12
17	DEWMA	241.24	81.1	0.0500	0.12
18	EWMA	241.38	80.4	0.1000	0.12
19	at	241.60	80.1	0.0500	0.12
20	EWMA	241.61	80.8	0.0100	0.12
21	EWMA	242.46	79.1	0.2000	0.12
22	DEWMA	242.53	78.9	0.2000	0.12
23	Ft	243.66	77.6	0.1000	0.12
24	EWMA	243.72	78.4	0.0050	0.12
25	bt	244.23	76.9	0.0500	0.12
26	at	244.73	76.2	0.1000	0.12
27	DEWMA	245.17	75.5	0.3000	0.12
28	DEWMA	248.32	72.8	0.0050	0.12
29	Ft	248.44	71.0	0.2000	0.12
30	at	248.84	70.4	0.2000	0.12
31	EWMA	248.94	70.1	0.3000	0.12
32	DEWMA	249.17	69.8	0.5000	0.12
33	EWMA	250.91	67.2	0.5000	0.12
34	bt	250.92	67.3	0.1000	0.12
35	Ft	252.01	65.3	0.3000	0.12
36	at	252.43	64.6	0.3000	0.12
37	Shewhart	253.45	62.9	0.0050	0.12
38	Shewhart	253.65	62.5	0.0010	0.12
39	Shewhart	253.79	62.2	0.2000	0.12
40	at	254.51	61.0	0.5000	0.12
41	Shewhart	254.54	60.9	0.0500	0.12
42	Shewhart	254.56	60.8	0.5000	0.12
43	Shewhart	254.62	60.8	0.1000	0.12
44	Shewhart	254.87	60.2	0.0005	0.12
45	Shewhart	255.22	59.6	0.3000	0.12
46	Shewhart	255.22	59.7	0.0100	0.12
47	bt	255.64	59.0	0.2000	0.12
48	bt	258.35	53.5	0.3000	0.12
49	bt	259.75	50.2	0.5000	0.12
50	EWMA	261.81	45.4	0.0010	0.12
51	EWMA	267.69	24.2	0.0005	0.12
52	Ft	269.75	8.1	0.5000	0.12
53	DEWMA	270.00	0.0	0.0005	0.12
54	DEWMA	270.00	0.0	0.0010	0.12

Table D4-14

	Chart	ARL1	SD	Lambda
1	Ft	212.61	108.7	0.0010
2	at	213.90	107.8	0.0010
3	at	214.44	107.5	0.0005
4	Ft	214.59	107.4	0.0005
5	bt	215.98	106.3	0.0005
6	bt	216.72	105.7	0.0010
7	Ft	230.89	92.9	0.0050
8	at	231.71	92.1	0.0050
9	Ft	235.55	87.6	0.0100
10	bt	235.92	87.4	0.0050
11	at	236.01	87.2	0.0100
12	DEWMA	236.91	87.7	0.0100
13	bt	237.50	85.4	0.0100
14	Ft	240.47	81.5	0.0500
15	EWMA	240.54	82.1	0.0100
16	EWMA	240.96	80.9	0.0500
17	at	241.50	80.2	0.0500
18	DEWMA	241.61	80.2	0.1000
19	DEWMA	242.77	78.6	0.2000
20	EWMA	243.07	79.2	0.0050
21	DEWMA	243.35	78.4	0.0500
22	EWMA	243.44	77.8	0.1000
23	DEWMA	243.45	77.9	0.3000
24	EWMA	243.50	77.7	0.2000
25	bt	243.66	77.6	0.0500
26	Ft	244.19	76.8	0.1000
27	at	245.58	75.0	0.1000
28	DEWMA	247.74	73.6	0.0050
29	EWMA	248.18	71.3	0.3000
30	DEWMA	248.57	70.8	0.5000
31	Ft	249.38	69.5	0.2000
32	at	250.01	68.5	0.2000
33	EWMA	250.13	68.4	0.5000
34	bt	251.02	67.1	0.1000
35	Ft	251.22	66.7	0.3000
36	at	251.83	65.6	0.3000
37	at	252.58	64.4	0.5000
38	Shewhart	253.18	63.4	0.5000
39	Shewhart	254.31	61.3	0.0050
40	Shewhart	254.44	61.1	0.0100
41	Shewhart	254.52	61.0	0.3000
42	Shewhart	254.81	60.4	0.2000
43	Shewhart	254.88	60.2	0.1000
44	Shewhart	255.10	59.9	0.0500
45	Shewhart	255.36	59.3	0.0005
46	Shewhart	255.80	58.5	0.0010
47	bt	256.71	56.9	0.2000
48	bt	257.51	55.3	0.3000
49	bt	257.70	54.8	0.5000
50	EWMA	260.29	49.3	0.0010
51	EWMA	267.91	23.1	0.0005
52	Ft	269.80	7.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-15

Average running length under shift = 0.13

	Chart	ARL1	SD	Lambda	shift
1	Ft	211.36	109.5	0.0010	0.13
2	at	212.69	108.6	0.0010	0.13
3	Ft	213.53	108.2	0.0005	0.13
4	at	213.84	107.9	0.0005	0.13
5	bt	214.91	106.9	0.0010	0.13
6	bt	214.92	107.1	0.0005	0.13
7	Ft	228.07	95.5	0.0050	0.13
8	at	228.59	94.9	0.0050	0.13
9	bt	234.70	88.6	0.0050	0.13
10	at	235.86	87.3	0.0100	0.13
11	Ft	235.88	87.3	0.0100	0.13
12	bt	236.50	86.3	0.0100	0.13
13	EWMA	237.24	85.2	0.0500	0.13
14	DEWMA	238.56	85.7	0.0100	0.13
15	DEWMA	238.69	83.9	0.0500	0.13
16	at	238.72	83.4	0.0500	0.13
17	Ft	238.81	83.4	0.0500	0.13
18	DEWMA	239.28	82.8	0.1000	0.13
19	DEWMA	239.96	82.0	0.2000	0.13
20	EWMA	240.69	81.3	0.2000	0.13
21	EWMA	240.87	81.7	0.0100	0.13
22	EWMA	241.43	81.3	0.0050	0.13
23	EWMA	241.86	79.6	0.1000	0.13
24	DEWMA	242.71	78.8	0.3000	0.13
25	Ft	243.35	77.9	0.1000	0.13
26	bt	243.53	77.7	0.0500	0.13
27	at	244.21	76.7	0.1000	0.13
28	DEWMA	246.59	75.3	0.0050	0.13
29	EWMA	247.52	72.2	0.3000	0.13
30	Ft	247.96	71.7	0.2000	0.13
31	at	248.47	70.9	0.2000	0.13
32	DEWMA	248.74	70.5	0.5000	0.13
33	bt	249.63	69.3	0.1000	0.13
34	at	251.39	66.4	0.3000	0.13
35	Ft	251.76	65.8	0.3000	0.13
36	EWMA	252.12	65.1	0.5000	0.13
37	Shewhart	253.70	62.4	0.0005	0.13
38	Shewhart	253.83	62.2	0.3000	0.13
39	Shewhart	253.84	62.2	0.1000	0.13
40	at	253.90	62.0	0.5000	0.13
41	Shewhart	254.19	61.5	0.0500	0.13
42	Shewhart	254.22	61.5	0.0100	0.13
43	Shewhart	254.75	60.5	0.2000	0.13
44	Shewhart	254.81	60.4	0.0010	0.13
45	Shewhart	255.10	59.9	0.5000	0.13
46	Shewhart	255.59	58.9	0.0050	0.13
47	bt	256.49	57.3	0.2000	0.13
48	bt	257.93	54.3	0.3000	0.13
49	bt	259.77	50.1	0.5000	0.13
50	EWMA	261.11	47.2	0.0010	0.13
51	EWMA	268.03	22.5	0.0005	0.13
52	Ft	269.67	9.2	0.5000	0.13
53	DEWMA	270.00	0.0	0.0005	0.13
54	DEWMA	270.00	0.0	0.0010	0.13

Table D4-15

	Chart	ARL1	SD	Lambda
1	Ft	211.31	109.6	0.0010
2	Ft	211.49	109.5	0.0005
3	at	211.71	109.4	0.0005
4	at	212.58	108.8	0.0010
5	bt	213.01	108.4	0.0005
6	bt	214.53	107.3	0.0010
7	Ft	228.59	95.1	0.0050
8	at	230.00	93.7	0.0050
9	at	234.00	89.1	0.0100
10	Ft	234.02	89.0	0.0100
11	bt	234.15	89.2	0.0050
12	bt	234.27	88.6	0.0100
13	EWMA	238.03	84.2	0.0500
14	Ft	238.30	83.9	0.0500
15	DEWMA	238.71	83.5	0.1000
16	at	238.99	83.1	0.0500
17	DEWMA	239.02	83.2	0.2000
18	EWMA	239.07	83.0	0.1000
19	DEWMA	239.19	85.1	0.0100
20	EWMA	239.68	82.5	0.2000
21	EWMA	240.15	82.5	0.0100
22	DEWMA	240.20	82.2	0.0500
23	EWMA	241.11	81.7	0.0050
24	Ft	241.23	80.6	0.1000
25	at	241.98	79.6	0.1000
26	DEWMA	242.32	79.2	0.3000
27	bt	242.61	78.9	0.0500
28	Ft	247.17	72.9	0.2000
29	EWMA	247.24	72.7	0.3000
30	at	247.29	72.7	0.2000
31	DEWMA	247.50	72.3	0.5000
32	DEWMA	247.84	73.5	0.0050
33	bt	249.48	69.6	0.1000
34	EWMA	250.54	67.7	0.5000
35	Ft	250.92	67.2	0.3000
36	at	251.23	66.6	0.3000
37	at	252.95	63.8	0.5000
38	Shewhart	253.79	62.2	0.0100
39	Shewhart	253.90	62.0	0.5000
40	Shewhart	254.12	61.7	0.0010
41	Shewhart	254.22	61.4	0.0005
42	Shewhart	254.27	61.3	0.3000
43	Shewhart	254.28	61.3	0.0500
44	Shewhart	254.60	60.7	0.0050
45	Shewhart	254.69	60.6	0.2000
46	Shewhart	254.92	60.2	0.1000
47	bt	256.16	58.0	0.2000
48	bt	257.48	55.3	0.3000
49	bt	258.72	52.6	0.5000
50	EWMA	259.57	51.0	0.0010
51	EWMA	267.89	23.2	0.0005
52	Ft	269.59	10.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-16

Average running length under shift = 0.14

	Chart	ARL1	SD	Lambda	shift
1	Ft	212.07	109.1	0.0005	0.14
2	Ft	212.08	109.0	0.0010	0.14
3	at	212.29	108.9	0.0005	0.14
4	at	213.05	108.3	0.0010	0.14
5	bt	213.86	107.7	0.0005	0.14
6	bt	215.19	106.7	0.0010	0.14
7	Ft	229.68	93.9	0.0050	0.14
8	at	230.39	93.2	0.0050	0.14
9	at	233.13	89.9	0.0100	0.14
10	Ft	233.27	89.8	0.0100	0.14
11	bt	233.75	89.1	0.0100	0.14
12	bt	234.87	88.3	0.0050	0.14
13	EWMA	235.12	87.4	0.0500	0.14
14	Ft	236.34	86.1	0.0500	0.14
15	at	236.92	85.5	0.0500	0.14
16	DEWMA	237.03	85.4	0.1000	0.14
17	DEWMA	237.53	85.2	0.0500	0.14
18	DEWMA	237.85	86.6	0.0100	0.14
19	DEWMA	238.25	84.0	0.2000	0.14
20	EWMA	238.74	83.4	0.1000	0.14
21	EWMA	239.29	83.4	0.0100	0.14
22	EWMA	240.36	81.6	0.2000	0.14
23	Ft	241.11	80.7	0.1000	0.14
24	at	241.79	79.9	0.1000	0.14
25	EWMA	241.82	80.7	0.0050	0.14
26	bt	242.01	79.7	0.0500	0.14
27	DEWMA	243.01	78.4	0.3000	0.14
28	DEWMA	245.54	75.0	0.5000	0.14
29	EWMA	246.29	74.0	0.3000	0.14
30	Ft	247.48	72.4	0.2000	0.14
31	DEWMA	248.00	73.2	0.0050	0.14
32	at	248.02	71.6	0.2000	0.14
33	EWMA	248.46	70.9	0.5000	0.14
34	bt	249.75	69.1	0.1000	0.14
35	at	250.33	68.0	0.3000	0.14
36	Ft	250.82	67.3	0.3000	0.14
37	at	252.36	64.8	0.5000	0.14
38	Shewhart	252.85	63.9	0.1000	0.14
39	Shewhart	253.67	62.5	0.0100	0.14
40	Shewhart	253.73	62.4	0.5000	0.14
41	Shewhart	253.76	62.4	0.0010	0.14
42	Shewhart	253.79	62.3	0.3000	0.14
43	Shewhart	254.03	61.9	0.0050	0.14
44	Shewhart	254.09	61.7	0.0005	0.14
45	Shewhart	254.58	60.8	0.0500	0.14
46	Shewhart	254.71	60.6	0.2000	0.14
47	bt	256.98	56.4	0.2000	0.14
48	bt	257.91	54.5	0.3000	0.14
49	EWMA	259.74	50.6	0.0010	0.14
50	bt	259.79	50.2	0.5000	0.14
51	EWMA	267.49	25.3	0.0005	0.14
52	Ft	269.77	7.7	0.5000	0.14
53	DEWMA	270.00	0.0	0.0005	0.14
54	DEWMA	270.00	0.0	0.0010	0.14

Table D4-16

	Chart	ARL1	SD	Lambda
1	Ft	211.22	109.6	0.0010
2	Ft	212.70	108.6	0.0005
3	at	212.78	108.5	0.0010
4	at	212.85	108.5	0.0005
5	bt	214.44	107.3	0.0005
6	bt	214.85	107.0	0.0010
7	Ft	227.33	96.0	0.0050
8	at	228.87	94.6	0.0050
9	bt	233.04	90.2	0.0050
10	Ft	234.02	89.0	0.0100
11	at	234.11	89.0	0.0100
12	bt	234.50	88.3	0.0100
13	DEWMA	235.99	86.4	0.1000
14	EWMA	237.30	85.1	0.0500
15	Ft	237.69	84.7	0.0500
16	at	238.49	83.7	0.0500
17	DEWMA	238.61	85.8	0.0100
18	DEWMA	239.07	83.5	0.0500
19	EWMA	239.14	82.9	0.1000
20	EWMA	239.33	83.5	0.0100
21	EWMA	239.70	82.4	0.2000
22	DEWMA	240.27	81.7	0.2000
23	DEWMA	241.47	80.3	0.3000
24	Ft	241.61	80.1	0.1000
25	EWMA	241.79	80.7	0.0050
26	at	242.06	79.6	0.1000
27	bt	242.09	79.6	0.0500
28	DEWMA	245.85	74.7	0.5000
29	EWMA	246.33	73.9	0.3000
30	Ft	246.66	73.6	0.2000
31	at	247.77	71.9	0.2000
32	EWMA	248.73	70.6	0.5000
33	Ft	249.32	69.7	0.3000
34	DEWMA	249.44	71.0	0.0050
35	at	249.49	69.4	0.3000
36	bt	250.04	68.7	0.1000
37	at	251.05	66.9	0.5000
38	Shewhart	253.28	63.2	0.5000
39	Shewhart	253.33	63.1	0.1000
40	Shewhart	253.36	63.0	0.3000
41	Shewhart	253.45	62.9	0.0005
42	Shewhart	253.54	62.6	0.0500
43	Shewhart	253.55	62.7	0.0100
44	Shewhart	254.20	61.5	0.0010
45	Shewhart	254.23	61.4	0.0050
46	Shewhart	255.40	59.2	0.2000
47	bt	256.02	58.3	0.2000
48	bt	258.15	53.8	0.3000
49	bt	259.12	51.6	0.5000
50	EWMA	260.78	48.0	0.0010
51	EWMA	267.57	24.9	0.0005
52	Ft	269.65	9.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-17

Average running length under shift = 0.15

	Chart	ARL1	SD	Lambda	shift
1	Ft	210.04	110.4	0.0005	0.15
2	at	210.31	110.2	0.0005	0.15
3	Ft	211.55	109.2	0.0010	0.15
4	bt	211.71	109.2	0.0005	0.15
5	at	212.79	108.4	0.0010	0.15
6	bt	214.86	106.8	0.0010	0.15
7	Ft	226.64	96.7	0.0050	0.15
8	at	227.52	95.9	0.0050	0.15
9	bt	231.75	91.6	0.0050	0.15
10	bt	231.89	90.9	0.0100	0.15
11	at	232.69	90.3	0.0100	0.15
12	Ft	232.93	90.1	0.0100	0.15
13	Ft	233.51	89.0	0.0500	0.15
14	EWMA	233.55	89.0	0.0500	0.15
15	at	234.63	87.8	0.0500	0.15
16	DEWMA	235.10	87.4	0.1000	0.15
17	EWMA	237.02	85.3	0.1000	0.15
18	DEWMA	237.16	85.2	0.2000	0.15
19	DEWMA	237.40	85.3	0.0500	0.15
20	DEWMA	238.57	85.8	0.0100	0.15
21	EWMA	238.80	83.9	0.0100	0.15
22	EWMA	239.08	83.2	0.2000	0.15
23	Ft	239.36	82.8	0.1000	0.15
24	bt	239.61	82.5	0.0500	0.15
25	EWMA	239.78	83.3	0.0050	0.15
26	DEWMA	239.88	82.2	0.3000	0.15
27	at	240.59	81.3	0.1000	0.15
28	EWMA	244.57	76.4	0.3000	0.15
29	DEWMA	246.29	74.0	0.5000	0.15
30	Ft	246.73	73.5	0.2000	0.15
31	DEWMA	247.18	74.5	0.0050	0.15
32	at	247.22	72.8	0.2000	0.15
33	bt	248.63	70.8	0.1000	0.15
34	EWMA	249.39	69.5	0.5000	0.15
35	at	249.42	69.5	0.3000	0.15
36	Ft	249.78	69.0	0.3000	0.15
37	at	252.15	65.1	0.5000	0.15
38	Shewhart	252.92	63.8	0.0500	0.15
39	Shewhart	253.28	63.2	0.2000	0.15
40	Shewhart	253.41	62.9	0.1000	0.15
41	Shewhart	253.41	63.0	0.0100	0.15
42	Shewhart	253.81	62.2	0.0005	0.15
43	Shewhart	253.90	62.1	0.5000	0.15
44	Shewhart	254.02	61.9	0.0010	0.15
45	Shewhart	254.27	61.4	0.3000	0.15
46	Shewhart	255.27	59.5	0.0050	0.15
47	bt	256.05	58.3	0.2000	0.15
48	bt	257.67	54.9	0.3000	0.15
49	bt	260.50	48.5	0.5000	0.15
50	EWMA	261.14	47.1	0.0010	0.15
51	EWMA	267.62	24.6	0.0005	0.15
52	Ft	269.69	8.9	0.5000	0.15
53	DEWMA	270.00	0.0	0.0005	0.15
54	DEWMA	270.00	0.0	0.0010	0.15

Table D4-17

	Chart	ARL1	SD	Lambda
1	Ft	207.37	112.1	0.0005
2	at	207.79	111.8	0.0005
3	bt	209.37	110.8	0.0005
4	Ft	213.19	108.2	0.0010
5	at	214.42	107.3	0.0010
6	bt	216.56	105.7	0.0010
7	Ft	227.51	95.9	0.0050
8	at	228.45	94.9	0.0050
9	bt	231.02	91.9	0.0100
10	Ft	231.19	91.9	0.0100
11	at	231.81	91.3	0.0100
12	bt	232.66	90.5	0.0050
13	EWMA	232.86	89.8	0.0500
14	Ft	233.57	89.0	0.0500
15	DEWMA	234.20	88.3	0.1000
16	at	234.38	88.2	0.0500
17	DEWMA	234.52	88.0	0.2000
18	EWMA	235.44	87.0	0.1000
19	EWMA	236.12	86.4	0.2000
20	DEWMA	236.97	85.8	0.0500
21	DEWMA	237.73	86.8	0.0100
22	DEWMA	238.49	83.8	0.3000
23	Ft	238.57	83.7	0.1000
24	EWMA	238.84	84.1	0.0100
25	at	239.62	82.5	0.1000
26	bt	239.65	82.5	0.0500
27	EWMA	240.65	82.2	0.0050
28	DEWMA	243.80	77.3	0.5000
29	EWMA	244.12	76.9	0.3000
30	Ft	244.73	76.2	0.2000
31	at	245.06	75.7	0.2000
32	DEWMA	247.68	73.7	0.0050
33	EWMA	247.72	72.0	0.5000
34	bt	248.86	70.5	0.1000
35	Ft	249.49	69.5	0.3000
36	at	249.56	69.3	0.3000
37	at	250.98	67.0	0.5000
38	Shewhart	252.69	64.2	0.5000
39	Shewhart	252.84	63.9	0.2000
40	Shewhart	252.92	63.8	0.0500
41	Shewhart	253.11	63.4	0.0005
42	Shewhart	253.16	63.3	0.0010
43	Shewhart	253.45	63.0	0.1000
44	Shewhart	253.52	62.8	0.3000
45	Shewhart	253.92	61.9	0.0050
46	Shewhart	254.22	61.5	0.0100
47	bt	254.56	61.1	0.2000
48	bt	257.58	55.2	0.3000
49	bt	257.80	54.5	0.5000
50	EWMA	260.88	47.8	0.0010
51	EWMA	267.87	23.3	0.0005
52	Ft	269.49	11.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-18

Average running length under shift = 0.16

	Chart	ARL1	SD	Lambda	shift
1	Ft	208.08	111.4	0.0010	0.16
2	at	209.32	110.6	0.0010	0.16
3	Ft	210.30	110.1	0.0005	0.16
4	at	210.39	110.1	0.0005	0.16
5	bt	211.57	109.1	0.0010	0.16
6	bt	211.90	109.0	0.0005	0.16
7	Ft	224.25	98.7	0.0050	0.16
8	at	225.24	97.8	0.0050	0.16
9	at	228.50	94.5	0.0100	0.16
10	Ft	228.52	94.4	0.0100	0.16
11	bt	229.29	93.5	0.0100	0.16
12	bt	229.30	93.8	0.0050	0.16
13	Ft	231.47	91.1	0.0500	0.16
14	at	231.59	90.9	0.0500	0.16
15	EWMA	231.72	90.8	0.0500	0.16
16	DEWMA	232.54	90.0	0.1000	0.16
17	DEWMA	234.25	88.3	0.2000	0.16
18	EWMA	235.05	87.4	0.1000	0.16
19	EWMA	235.27	87.9	0.0100	0.16
20	EWMA	235.46	87.1	0.2000	0.16
21	DEWMA	235.88	88.8	0.0100	0.16
22	bt	236.56	86.0	0.0500	0.16
23	DEWMA	236.72	85.8	0.3000	0.16
24	Ft	237.11	85.4	0.1000	0.16
25	DEWMA	237.28	85.4	0.0500	0.16
26	at	238.33	84.0	0.1000	0.16
27	EWMA	239.72	83.3	0.0050	0.16
28	EWMA	242.89	78.5	0.3000	0.16
29	DEWMA	243.05	78.4	0.5000	0.16
30	Ft	245.03	75.8	0.2000	0.16
31	at	245.52	75.1	0.2000	0.16
32	EWMA	246.10	74.3	0.5000	0.16
33	DEWMA	247.39	74.1	0.0050	0.16
34	bt	247.53	72.5	0.1000	0.16
35	at	247.83	71.9	0.3000	0.16
36	Ft	247.91	71.8	0.3000	0.16
37	at	249.91	68.8	0.5000	0.16
38	Shewhart	251.09	66.9	0.5000	0.16
39	Shewhart	252.21	65.0	0.0050	0.16
40	Shewhart	252.57	64.4	0.2000	0.16
41	Shewhart	252.60	64.4	0.3000	0.16
42	Shewhart	252.67	64.2	0.0100	0.16
43	Shewhart	253.05	63.5	0.1000	0.16
44	Shewhart	253.22	63.3	0.0500	0.16
45	Shewhart	253.49	62.8	0.0010	0.16
46	Shewhart	253.71	62.3	0.0005	0.16
47	bt	255.61	59.1	0.2000	0.16
48	bt	256.72	56.9	0.3000	0.16
49	bt	257.52	55.2	0.5000	0.16
50	EWMA	259.19	51.9	0.0010	0.16
51	EWMA	267.66	24.5	0.0005	0.16
52	Ft	269.74	8.1	0.5000	0.16
53	DEWMA	270.00	0.0	0.0005	0.16
54	DEWMA	270.00	0.0	0.0010	0.16

Table D4-18

	Chart	ARL1	SD	Lambda
1	Ft	208.26	111.5	0.0005
2	at	208.47	111.3	0.0005
3	Ft	209.43	110.6	0.0010
4	bt	209.65	110.5	0.0005
5	at	210.62	109.7	0.0010
6	bt	212.93	108.1	0.0010
7	Ft	224.45	98.5	0.0050
8	at	225.23	97.8	0.0050
9	bt	229.25	93.5	0.0100
10	Ft	229.28	93.7	0.0100
11	at	229.51	93.5	0.0100
12	bt	229.72	93.3	0.0050
13	DEWMA	232.20	90.3	0.1000
14	Ft	232.39	90.1	0.0500
15	EWMA	232.84	89.7	0.0500
16	at	233.05	89.4	0.0500
17	EWMA	234.80	87.6	0.1000
18	DEWMA	235.48	87.0	0.2000
19	EWMA	235.95	86.7	0.2000
20	EWMA	236.01	87.1	0.0100
21	DEWMA	236.16	86.7	0.0500
22	DEWMA	237.02	87.5	0.0100
23	bt	237.80	84.6	0.0500
24	DEWMA	237.83	84.6	0.3000
25	Ft	237.86	84.5	0.1000
26	EWMA	238.56	84.6	0.0050
27	at	239.70	82.3	0.1000
28	DEWMA	243.90	77.2	0.5000
29	EWMA	244.04	77.1	0.3000
30	at	244.50	76.5	0.2000
31	Ft	244.74	76.2	0.2000
32	DEWMA	247.75	73.5	0.0050
33	EWMA	248.27	71.1	0.5000
34	Ft	248.36	71.1	0.3000
35	at	248.47	70.8	0.3000
36	bt	248.90	70.5	0.1000
37	at	251.79	65.7	0.5000
38	Shewhart	251.91	65.5	0.1000
39	Shewhart	252.20	65.1	0.0500
40	Shewhart	252.74	64.1	0.0005
41	Shewhart	252.79	64.0	0.0050
42	Shewhart	252.89	63.9	0.5000
43	Shewhart	252.89	63.8	0.3000
44	Shewhart	253.04	63.6	0.2000
45	Shewhart	253.38	63.0	0.0100
46	Shewhart	253.73	62.4	0.0010
47	bt	255.24	59.9	0.2000
48	bt	256.96	56.3	0.3000
49	bt	258.41	53.3	0.5000
50	EWMA	260.34	49.0	0.0010
51	EWMA	267.21	26.7	0.0005
52	Ft	269.56	10.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-19

Average running length under shift = 0.17

	Chart	ARL1	SD	Lambda	shift
1	Ft	207.05	112.1	0.0010	0.17
2	Ft	207.33	112.0	0.0005	0.17
3	at	207.57	111.9	0.0005	0.17
4	at	207.87	111.6	0.0010	0.17
5	bt	209.16	110.8	0.0005	0.17
6	bt	209.75	110.3	0.0010	0.17
7	Ft	222.09	100.5	0.0050	0.17
8	at	223.21	99.5	0.0050	0.17
9	bt	225.24	96.9	0.0100	0.17
10	Ft	226.13	96.4	0.0100	0.17
11	at	226.18	96.3	0.0100	0.17
12	bt	227.19	95.7	0.0050	0.17
13	EWMA	228.34	93.9	0.0500	0.17
14	Ft	229.37	93.0	0.0500	0.17
15	DEWMA	229.42	92.9	0.1000	0.17
16	at	229.43	92.9	0.0500	0.17
17	EWMA	229.94	92.4	0.1000	0.17
18	DEWMA	230.05	92.4	0.2000	0.17
19	EWMA	231.34	91.3	0.2000	0.17
20	Ft	233.12	89.6	0.1000	0.17
21	DEWMA	233.86	89.0	0.0500	0.17
22	EWMA	233.92	89.2	0.0100	0.17
23	at	234.83	87.8	0.1000	0.17
24	DEWMA	235.54	87.0	0.3000	0.17
25	bt	235.94	86.7	0.0500	0.17
26	EWMA	236.80	86.6	0.0050	0.17
27	DEWMA	238.12	86.2	0.0100	0.17
28	EWMA	241.08	80.8	0.3000	0.17
29	DEWMA	241.98	79.7	0.5000	0.17
30	at	241.99	79.8	0.2000	0.17
31	Ft	242.14	79.7	0.2000	0.17
32	bt	245.61	75.2	0.1000	0.17
33	EWMA	246.86	73.3	0.5000	0.17
34	Ft	247.14	72.9	0.3000	0.17
35	at	247.38	72.6	0.3000	0.17
36	DEWMA	247.41	74.1	0.0050	0.17
37	at	250.58	67.7	0.5000	0.17
38	Shewhart	251.58	66.0	0.0100	0.17
39	Shewhart	251.67	65.9	0.0005	0.17
40	Shewhart	251.83	65.6	0.5000	0.17
41	Shewhart	251.92	65.5	0.0010	0.17
42	Shewhart	252.12	65.1	0.3000	0.17
43	Shewhart	252.25	64.9	0.0500	0.17
44	Shewhart	252.43	64.6	0.2000	0.17
45	Shewhart	252.70	64.1	0.0050	0.17
46	Shewhart	253.03	63.6	0.1000	0.17
47	bt	254.88	60.5	0.2000	0.17
48	bt	256.89	56.5	0.3000	0.17
49	EWMA	258.14	54.1	0.0010	0.17
50	bt	258.42	53.3	0.5000	0.17
51	EWMA	267.56	24.9	0.0005	0.17
52	Ft	269.51	11.1	0.5000	0.17
53	DEWMA	270.00	0.0	0.0005	0.17
54	DEWMA	270.00	0.0	0.0010	0.17

Table D4-19

	Chart	ARL1	SD	Lambda
1	at	207.79	111.7	0.0005
2	Ft	207.91	111.6	0.0005
3	bt	209.00	110.8	0.0005
4	Ft	211.93	108.9	0.0010
5	at	213.11	108.1	0.0010
6	bt	215.14	106.6	0.0010
7	Ft	221.43	100.9	0.0050
8	at	222.92	99.7	0.0050
9	bt	226.34	96.0	0.0100
10	Ft	227.40	95.3	0.0100
11	at	227.61	95.1	0.0100
12	bt	227.61	95.3	0.0050
13	DEWMA	228.82	93.5	0.1000
14	Ft	229.05	93.3	0.0500
15	EWMA	229.35	93.0	0.0500
16	at	229.73	92.6	0.0500
17	DEWMA	231.67	90.8	0.2000
18	EWMA	232.23	90.4	0.2000
19	EWMA	232.24	90.3	0.1000
20	DEWMA	233.43	89.2	0.3000
21	DEWMA	234.76	88.1	0.0500
22	EWMA	235.17	87.9	0.0100
23	bt	236.25	86.3	0.0500
24	EWMA	236.54	86.9	0.0050
25	Ft	236.55	85.9	0.1000
26	DEWMA	236.76	87.8	0.0100
27	at	237.90	84.4	0.1000
28	EWMA	239.73	82.4	0.3000
29	at	242.51	79.0	0.2000
30	Ft	243.04	78.4	0.2000
31	DEWMA	243.54	77.7	0.5000
32	at	246.17	74.3	0.3000
33	DEWMA	246.18	75.8	0.0050
34	Ft	246.94	73.2	0.3000
35	bt	247.40	72.7	0.1000
36	EWMA	247.90	71.8	0.5000
37	Shewhart	251.03	67.0	0.3000
38	Shewhart	251.70	65.9	0.0005
39	Shewhart	252.15	65.0	0.0500
40	at	252.19	65.1	0.5000
41	Shewhart	252.38	64.7	0.0010
42	Shewhart	252.60	64.3	0.0100
43	Shewhart	252.91	63.8	0.5000
44	Shewhart	252.99	63.7	0.1000
45	Shewhart	253.22	63.3	0.0050
46	Shewhart	254.10	61.7	0.2000
47	bt	255.38	59.6	0.2000
48	bt	256.96	56.4	0.3000
49	bt	258.82	52.3	0.5000
50	EWMA	260.47	48.7	0.0010
51	EWMA	267.31	26.2	0.0005
52	Ft	269.44	11.9	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-20

Average running length under shift = 0.18

	Chart	ARL1	SD	Lambda	shift
1	Ft	206.84	112.1	0.0010	0.18
2	Ft	207.91	111.5	0.0005	0.18
3	at	207.93	111.5	0.0010	0.18
4	at	208.68	111.0	0.0005	0.18
5	bt	209.66	110.3	0.0005	0.18
6	bt	209.93	110.1	0.0010	0.18
7	Ft	221.28	101.0	0.0050	0.18
8	at	222.56	99.9	0.0050	0.18
9	bt	225.65	97.0	0.0050	0.18
10	at	226.07	96.4	0.0100	0.18
11	DEWMA	226.13	95.8	0.1000	0.18
12	bt	226.24	96.0	0.0100	0.18
13	Ft	226.32	96.2	0.0100	0.18
14	EWMA	227.70	94.5	0.0500	0.18
15	at	227.72	94.5	0.0500	0.18
16	Ft	227.84	94.4	0.0500	0.18
17	EWMA	229.82	92.6	0.1000	0.18
18	DEWMA	230.57	91.9	0.2000	0.18
19	EWMA	231.45	91.2	0.2000	0.18
20	DEWMA	232.69	90.2	0.0500	0.18
21	DEWMA	233.24	89.4	0.3000	0.18
22	EWMA	233.48	89.7	0.0100	0.18
23	Ft	233.68	89.0	0.1000	0.18
24	at	234.49	88.1	0.1000	0.18
25	bt	234.72	88.0	0.0500	0.18
26	EWMA	237.21	85.9	0.0050	0.18
27	DEWMA	237.49	87.0	0.0100	0.18
28	DEWMA	240.38	81.7	0.5000	0.18
29	EWMA	240.62	81.4	0.3000	0.18
30	Ft	242.32	79.4	0.2000	0.18
31	at	243.14	78.3	0.2000	0.18
32	EWMA	244.77	76.2	0.5000	0.18
33	Ft	245.40	75.4	0.3000	0.18
34	bt	245.65	75.2	0.1000	0.18
35	at	245.89	74.6	0.3000	0.18
36	at	248.02	71.6	0.5000	0.18
37	DEWMA	248.68	72.1	0.0050	0.18
38	Shewhart	250.88	67.2	0.3000	0.18
39	Shewhart	251.13	66.8	0.1000	0.18
40	Shewhart	251.13	66.8	0.0005	0.18
41	Shewhart	251.19	66.7	0.5000	0.18
42	Shewhart	251.30	66.4	0.0500	0.18
43	Shewhart	251.56	66.1	0.0100	0.18
44	Shewhart	251.85	65.6	0.0010	0.18
45	Shewhart	252.66	64.2	0.0050	0.18
46	Shewhart	253.35	63.0	0.2000	0.18
47	bt	254.60	61.1	0.2000	0.18
48	bt	257.32	55.6	0.3000	0.18
49	bt	258.93	52.1	0.5000	0.18
50	EWMA	259.29	51.5	0.0010	0.18
51	EWMA	267.25	26.5	0.0005	0.18
52	Ft	269.62	9.8	0.5000	0.18
53	DEWMA	270.00	0.0	0.0005	0.18
54	DEWMA	270.00	0.0	0.0010	0.18

Table D4-20

	Chart	ARL1	SD	Lambda
1	Ft	207.81	111.5	0.0010
2	at	208.84	110.8	0.0010
3	Ft	209.45	110.5	0.0005
4	at	210.04	110.2	0.0005
5	bt	210.54	109.6	0.0010
6	bt	210.96	109.5	0.0005
7	Ft	222.11	100.2	0.0050
8	at	223.13	99.4	0.0050
9	Ft	223.40	98.7	0.0100
10	at	223.44	98.6	0.0100
11	bt	224.34	97.7	0.0100
12	bt	225.66	96.9	0.0050
13	EWMA	226.26	95.8	0.0500
14	DEWMA	227.16	95.0	0.1000
15	Ft	227.29	94.9	0.0500
16	at	227.98	94.3	0.0500
17	DEWMA	228.76	93.6	0.2000
18	EWMA	229.48	92.9	0.1000
19	EWMA	229.71	92.9	0.2000
20	DEWMA	231.56	91.3	0.0500
21	EWMA	231.87	91.3	0.0100
22	Ft	234.08	88.6	0.1000
23	at	234.90	87.7	0.1000
24	bt	235.18	87.4	0.0500
25	DEWMA	235.34	87.1	0.3000
26	DEWMA	235.72	89.0	0.0100
27	EWMA	238.15	84.8	0.0050
28	DEWMA	240.64	81.3	0.5000
29	at	240.73	81.3	0.2000
30	Ft	240.91	81.1	0.2000
31	EWMA	241.06	80.8	0.3000
32	EWMA	244.97	75.9	0.5000
33	bt	245.68	75.1	0.1000
34	Ft	247.10	73.0	0.3000
35	at	247.25	72.7	0.3000
36	DEWMA	248.47	72.4	0.0050
37	at	249.56	69.3	0.5000
38	Shewhart	250.48	67.8	0.5000
39	Shewhart	250.65	67.5	0.2000
40	Shewhart	251.27	66.6	0.0010
41	Shewhart	251.55	66.1	0.0500
42	Shewhart	251.91	65.6	0.1000
43	Shewhart	252.04	65.3	0.0100
44	Shewhart	252.05	65.3	0.0005
45	Shewhart	252.26	64.9	0.3000
46	Shewhart	252.87	63.8	0.0050
47	bt	253.23	63.5	0.2000
48	bt	258.19	53.8	0.3000
49	bt	258.20	53.7	0.5000
50	EWMA	259.84	50.2	0.0010
51	EWMA	267.97	22.8	0.0005
52	Ft	269.49	11.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-21

Average running length under shift = 0.19

	Chart	ARL1	SD	Lambda	shift
1	Ft	203.28	114.3	0.0005	0.19
2	at	203.36	114.3	0.0005	0.19
3	bt	204.60	113.5	0.0005	0.19
4	Ft	208.78	110.9	0.0010	0.19
5	at	209.99	110.1	0.0010	0.19
6	bt	211.63	108.9	0.0010	0.19
7	Ft	220.78	101.3	0.0050	0.19
8	at	221.71	100.5	0.0050	0.19
9	EWMA	222.24	99.1	0.0500	0.19
10	DEWMA	222.97	98.4	0.1000	0.19
11	bt	223.05	98.8	0.0100	0.19
12	Ft	223.17	98.4	0.0500	0.19
13	at	223.35	98.7	0.0100	0.19
14	Ft	223.54	98.6	0.0100	0.19
15	at	223.86	97.8	0.0500	0.19
16	DEWMA	224.56	97.2	0.2000	0.19
17	EWMA	225.20	96.7	0.1000	0.19
18	bt	225.33	97.1	0.0050	0.19
19	EWMA	227.18	95.1	0.2000	0.19
20	DEWMA	229.46	93.1	0.0500	0.19
21	DEWMA	230.34	92.2	0.3000	0.19
22	Ft	230.64	92.0	0.1000	0.19
23	at	231.16	91.4	0.1000	0.19
24	EWMA	232.37	90.8	0.0100	0.19
25	bt	232.42	90.3	0.0500	0.19
26	EWMA	235.67	87.7	0.0050	0.19
27	DEWMA	236.78	87.8	0.0100	0.19
28	DEWMA	238.22	84.1	0.5000	0.19
29	EWMA	238.40	84.0	0.3000	0.19
30	at	238.95	83.3	0.2000	0.19
31	Ft	239.25	83.0	0.2000	0.19
32	EWMA	242.77	78.7	0.5000	0.19
33	bt	244.95	76.1	0.1000	0.19
34	at	245.39	75.4	0.3000	0.19
35	Ft	245.66	75.0	0.3000	0.19
36	DEWMA	247.06	74.5	0.0050	0.19
37	at	248.07	71.5	0.5000	0.19
38	Shewhart	250.21	68.3	0.5000	0.19
39	Shewhart	250.52	67.7	0.2000	0.19
40	Shewhart	250.68	67.5	0.0500	0.19
41	Shewhart	250.82	67.3	0.0010	0.19
42	Shewhart	251.30	66.5	0.0005	0.19
43	Shewhart	251.47	66.3	0.3000	0.19
44	Shewhart	251.67	65.9	0.0100	0.19
45	Shewhart	251.71	66.0	0.1000	0.19
46	Shewhart	251.81	65.6	0.0050	0.19
47	bt	253.08	63.8	0.2000	0.19
48	bt	257.02	56.4	0.3000	0.19
49	bt	257.64	54.9	0.5000	0.19
50	EWMA	259.62	50.7	0.0010	0.19
51	EWMA	267.21	26.5	0.0005	0.19
52	Ft	269.39	12.4	0.5000	0.19
53	DEWMA	270.00	0.0	0.0005	0.19
54	DEWMA	270.00	0.0	0.0010	0.19

Table D4-21

	Chart	ARL1	SD	Lambda
1	Ft	205.65	112.9	0.0005
2	Ft	206.48	112.2	0.0010
3	at	206.59	112.4	0.0005
4	bt	207.56	111.7	0.0005
5	at	207.58	111.5	0.0010
6	bt	209.44	110.3	0.0010
7	Ft	220.19	101.8	0.0050
8	bt	221.10	100.2	0.0100
9	at	221.28	101.0	0.0050
10	Ft	222.17	99.6	0.0100
11	at	222.76	99.1	0.0100
12	EWMA	223.90	97.7	0.0500
13	Ft	224.89	96.9	0.0500
14	DEWMA	224.97	96.7	0.1000
15	bt	225.14	97.4	0.0050
16	at	225.21	96.6	0.0500
17	DEWMA	226.81	95.3	0.2000
18	EWMA	227.54	94.6	0.1000
19	EWMA	229.29	93.1	0.2000
20	DEWMA	231.17	91.5	0.0500
21	EWMA	231.24	91.8	0.0100
22	DEWMA	231.93	90.6	0.3000
23	Ft	232.03	90.6	0.1000
24	bt	232.60	90.1	0.0500
25	at	232.79	89.8	0.1000
26	EWMA	235.65	87.7	0.0050
27	DEWMA	236.75	87.8	0.0100
28	DEWMA	238.54	83.7	0.5000
29	EWMA	238.59	83.6	0.3000
30	Ft	241.34	80.6	0.2000
31	at	241.36	80.5	0.2000
32	bt	244.62	76.6	0.1000
33	EWMA	244.80	76.1	0.5000
34	Ft	245.24	75.5	0.3000
35	at	245.83	74.6	0.3000
36	DEWMA	247.26	74.2	0.0050
37	at	249.45	69.4	0.5000
38	Shewhart	250.55	67.7	0.0050
39	Shewhart	250.78	67.4	0.0010
40	Shewhart	250.85	67.2	0.0500
41	Shewhart	251.04	66.9	0.0005
42	Shewhart	251.10	66.8	0.1000
43	Shewhart	251.54	66.1	0.5000
44	Shewhart	251.76	65.7	0.3000
45	Shewhart	252.38	64.7	0.2000
46	Shewhart	252.41	64.6	0.0100
47	bt	255.37	59.7	0.2000
48	bt	256.94	56.4	0.3000
49	EWMA	258.50	53.3	0.0010
50	bt	259.81	50.1	0.5000
51	EWMA	267.25	26.4	0.0005
52	Ft	269.54	10.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-22

Average running length under shift = 0.2

	Chart	ARL1	SD	Lambda	shift
1	Ft	203.05	114.3	0.0005	0.2
2	at	203.41	114.1	0.0005	0.2
3	Ft	204.80	113.2	0.0010	0.2
4	bt	205.07	113.1	0.0005	0.2
5	at	206.18	112.3	0.0010	0.2
6	bt	207.56	111.4	0.0010	0.2
7	Ft	217.03	104.1	0.0050	0.2
8	at	218.09	103.3	0.0050	0.2
9	bt	219.13	101.8	0.0100	0.2
10	at	220.39	101.0	0.0100	0.2
11	Ft	220.47	100.4	0.0500	0.2
12	Ft	220.68	100.8	0.0100	0.2
13	EWMA	220.91	100.0	0.0500	0.2
14	DEWMA	221.45	99.6	0.1000	0.2
15	at	221.86	99.3	0.0500	0.2
16	bt	222.01	99.8	0.0050	0.2
17	EWMA	224.65	97.0	0.1000	0.2
18	DEWMA	224.85	96.9	0.2000	0.2
19	EWMA	226.62	95.6	0.2000	0.2
20	DEWMA	228.27	94.2	0.0500	0.2
21	Ft	229.51	93.0	0.1000	0.2
22	DEWMA	229.66	92.9	0.3000	0.2
23	EWMA	229.81	93.2	0.0100	0.2
24	bt	230.02	92.6	0.0500	0.2
25	at	230.64	91.9	0.1000	0.2
26	EWMA	233.86	89.5	0.0050	0.2
27	DEWMA	235.51	89.1	0.0100	0.2
28	EWMA	236.99	85.5	0.3000	0.2
29	DEWMA	237.49	84.9	0.5000	0.2
30	at	238.96	83.4	0.2000	0.2
31	Ft	239.16	83.2	0.2000	0.2
32	EWMA	243.56	77.7	0.5000	0.2
33	at	244.04	77.1	0.3000	0.2
34	Ft	244.43	76.6	0.3000	0.2
35	bt	244.81	76.4	0.1000	0.2
36	DEWMA	247.39	74.0	0.0050	0.2
37	at	248.43	71.0	0.5000	0.2
38	Shewhart	249.90	68.8	0.0500	0.2
39	Shewhart	249.95	68.7	0.1000	0.2
40	Shewhart	250.26	68.2	0.0005	0.2
41	Shewhart	250.60	67.6	0.3000	0.2
42	Shewhart	250.61	67.7	0.5000	0.2
43	Shewhart	250.76	67.4	0.0050	0.2
44	Shewhart	250.88	67.3	0.0100	0.2
45	Shewhart	251.05	66.9	0.2000	0.2
46	Shewhart	251.48	66.2	0.0010	0.2
47	bt	253.77	62.6	0.2000	0.2
48	bt	256.38	57.5	0.3000	0.2
49	bt	258.17	53.9	0.5000	0.2
50	EWMA	258.69	52.7	0.0010	0.2
51	EWMA	266.76	28.7	0.0005	0.2
52	Ft	269.52	11.1	0.5000	0.2
53	DEWMA	270.00	0.0	0.0005	0.2
54	DEWMA	270.00	0.0	0.0010	0.2

Table D4-22

	Chart	ARL1	SD	Lambda
1	Ft	203.66	114.0	0.0005
2	at	203.93	113.8	0.0005
3	bt	204.82	113.2	0.0005
4	Ft	205.66	112.8	0.0010
5	at	206.64	112.1	0.0010
6	bt	208.61	110.8	0.0010
7	Ft	216.86	104.2	0.0050
8	at	218.56	102.9	0.0050
9	bt	220.91	100.4	0.0100
10	EWMA	220.97	100.0	0.0500
11	Ft	221.47	100.1	0.0100
12	at	221.53	100.0	0.0100
13	bt	221.60	100.2	0.0050
14	DEWMA	221.64	99.6	0.2000
15	Ft	222.01	99.2	0.0500
16	at	222.21	99.0	0.0500
17	DEWMA	222.49	98.8	0.1000
18	EWMA	224.13	97.5	0.1000
19	EWMA	224.63	97.3	0.2000
20	DEWMA	228.27	94.1	0.0500
21	DEWMA	228.60	93.8	0.3000
22	Ft	229.01	93.5	0.1000
23	at	229.96	92.6	0.1000
24	EWMA	230.41	92.5	0.0100
25	bt	231.06	91.5	0.0500
26	EWMA	234.67	88.7	0.0050
27	DEWMA	236.20	88.3	0.0100
28	EWMA	237.33	85.1	0.3000
29	DEWMA	238.13	84.2	0.5000
30	at	238.92	83.4	0.2000
31	Ft	239.49	82.8	0.2000
32	EWMA	243.22	78.2	0.5000
33	bt	244.56	76.7	0.1000
34	at	244.98	75.8	0.3000
35	Ft	245.60	75.0	0.3000
36	DEWMA	246.88	74.9	0.0050
37	at	248.87	70.3	0.5000
38	Shewhart	250.12	68.4	0.2000
39	Shewhart	250.30	68.2	0.0005
40	Shewhart	250.55	67.8	0.1000
41	Shewhart	250.83	67.2	0.0010
42	Shewhart	251.16	66.7	0.5000
43	Shewhart	251.16	66.8	0.0100
44	Shewhart	251.25	66.6	0.0500
45	Shewhart	251.32	66.5	0.0050
46	Shewhart	251.39	66.4	0.3000
47	bt	254.44	61.4	0.2000
48	bt	257.24	55.9	0.3000
49	EWMA	258.75	52.8	0.0010
50	bt	259.25	51.3	0.5000
51	EWMA	267.09	27.2	0.0005
52	Ft	269.60	10.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-23

Average running length under shift = 0.21

	Chart	ARL1	SD	Lambda	shift
1	Ft	202.99	114.3	0.0005	0.21
2	at	203.38	114.1	0.0005	0.21
3	bt	204.30	113.5	0.0005	0.21
4	Ft	207.24	111.7	0.0010	0.21
5	at	208.41	111.0	0.0010	0.21
6	bt	210.07	109.8	0.0010	0.21
7	Ft	214.88	105.7	0.0050	0.21
8	at	216.18	104.7	0.0050	0.21
9	bt	216.51	103.6	0.0100	0.21
10	at	217.42	103.1	0.0100	0.21
11	DEWMA	217.43	102.6	0.1000	0.21
12	Ft	217.50	103.1	0.0100	0.21
13	EWMA	217.56	102.5	0.0500	0.21
14	Ft	217.83	102.4	0.0500	0.21
15	at	218.34	102.0	0.0500	0.21
16	bt	219.11	102.1	0.0050	0.21
17	DEWMA	220.91	100.2	0.2000	0.21
18	EWMA	221.33	99.8	0.1000	0.21
19	EWMA	222.80	98.8	0.2000	0.21
20	DEWMA	225.09	96.9	0.3000	0.21
21	DEWMA	226.59	95.6	0.0500	0.21
22	bt	226.95	95.3	0.0500	0.21
23	Ft	227.41	94.9	0.1000	0.21
24	at	228.02	94.3	0.1000	0.21
25	EWMA	228.09	94.7	0.0100	0.21
26	EWMA	231.52	91.9	0.0050	0.21
27	EWMA	233.28	89.5	0.3000	0.21
28	DEWMA	235.63	88.9	0.0100	0.21
29	Ft	236.62	86.0	0.2000	0.21
30	at	236.79	85.8	0.2000	0.21
31	DEWMA	237.49	84.9	0.5000	0.21
32	at	242.10	79.6	0.3000	0.21
33	Ft	242.57	79.1	0.3000	0.21
34	EWMA	243.80	77.5	0.5000	0.21
35	bt	243.83	77.6	0.1000	0.21
36	DEWMA	245.82	76.3	0.0050	0.21
37	Shewhart	248.56	70.8	0.3000	0.21
38	at	249.03	70.1	0.5000	0.21
39	Shewhart	249.45	69.5	0.0005	0.21
40	Shewhart	249.91	68.8	0.0010	0.21
41	Shewhart	250.05	68.4	0.0500	0.21
42	Shewhart	250.23	68.3	0.5000	0.21
43	Shewhart	250.31	68.1	0.0100	0.21
44	Shewhart	250.54	67.8	0.0050	0.21
45	Shewhart	251.13	66.8	0.1000	0.21
46	Shewhart	252.05	65.3	0.2000	0.21
47	bt	254.04	62.2	0.2000	0.21
48	bt	256.29	57.8	0.3000	0.21
49	bt	258.61	52.8	0.5000	0.21
50	EWMA	259.04	52.0	0.0010	0.21
51	EWMA	266.89	28.1	0.0005	0.21
52	Ft	269.34	13.0	0.5000	0.21
53	DEWMA	270.00	0.0	0.0005	0.21
54	DEWMA	270.00	0.0	0.0010	0.21

Table D4-23

	Chart	ARL1	SD	Lambda
1	Ft	202.84	114.4	0.0005
2	at	203.24	114.1	0.0005
3	Ft	204.30	113.4	0.0010
4	bt	204.47	113.3	0.0005
5	at	205.51	112.7	0.0010
6	bt	207.32	111.5	0.0010
7	Ft	214.36	106.0	0.0050
8	at	214.97	105.5	0.0050
9	EWMA	216.29	103.5	0.0500
10	bt	217.25	103.4	0.0050
11	Ft	217.44	102.7	0.0500
12	bt	217.55	102.8	0.0100
13	DEWMA	218.42	101.9	0.1000
14	at	218.52	101.9	0.0500
15	at	218.61	102.3	0.0100
16	Ft	218.89	102.1	0.0100
17	DEWMA	220.15	100.7	0.2000
18	EWMA	221.47	99.7	0.1000
19	EWMA	222.39	99.1	0.2000
20	DEWMA	225.63	96.5	0.0500
21	DEWMA	226.59	95.6	0.3000
22	Ft	226.84	95.4	0.1000
23	bt	227.90	94.5	0.0500
24	at	228.20	94.2	0.1000
25	EWMA	228.22	94.7	0.0100
26	EWMA	232.82	90.6	0.0050
27	DEWMA	234.07	90.6	0.0100
28	EWMA	235.62	87.0	0.3000
29	DEWMA	235.99	86.6	0.5000
30	at	237.34	85.2	0.2000
31	Ft	237.54	85.0	0.2000
32	EWMA	241.40	80.4	0.5000
33	bt	242.63	79.2	0.1000
34	Ft	243.28	78.2	0.3000
35	at	243.95	77.3	0.3000
36	DEWMA	246.63	75.2	0.0050
37	at	248.24	71.3	0.5000
38	Shewhart	249.58	69.2	0.0005
39	Shewhart	249.93	68.7	0.0100
40	Shewhart	249.94	68.7	0.5000
41	Shewhart	249.99	68.6	0.0050
42	Shewhart	250.07	68.5	0.0500
43	Shewhart	250.07	68.5	0.2000
44	Shewhart	250.53	67.8	0.1000
45	Shewhart	250.66	67.5	0.3000
46	Shewhart	250.79	67.3	0.0010
47	bt	253.56	63.0	0.2000
48	bt	256.68	57.0	0.3000
49	EWMA	258.83	52.5	0.0010
50	bt	259.08	51.8	0.5000
51	EWMA	267.19	26.8	0.0005
52	Ft	269.59	10.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-24

Average running length under shift = 0.22

	Chart	ARL1	SD	Lambda	shift
1	Ft	202.32	114.5	0.0010	0.22
2	at	204.27	113.4	0.0010	0.22
3	Ft	204.64	113.3	0.0005	0.22
4	at	205.19	113.0	0.0005	0.22
5	bt	205.20	112.7	0.0010	0.22
6	bt	206.29	112.2	0.0005	0.22
7	EWMA	213.66	105.3	0.0500	0.22
8	Ft	213.82	105.6	0.0100	0.22
9	bt	213.95	105.3	0.0100	0.22
10	Ft	214.45	105.8	0.0050	0.22
11	at	214.76	105.0	0.0100	0.22
12	Ft	215.51	104.1	0.0500	0.22
13	at	215.52	105.0	0.0050	0.22
14	DEWMA	215.73	103.9	0.2000	0.22
15	at	215.95	103.8	0.0500	0.22
16	DEWMA	216.15	103.5	0.1000	0.22
17	bt	217.37	103.2	0.0050	0.22
18	EWMA	217.96	102.3	0.1000	0.22
19	EWMA	219.68	101.3	0.2000	0.22
20	DEWMA	223.70	98.1	0.0500	0.22
21	Ft	224.68	97.3	0.1000	0.22
22	EWMA	224.88	97.5	0.0100	0.22
23	at	225.03	97.0	0.1000	0.22
24	DEWMA	225.37	96.6	0.3000	0.22
25	bt	226.91	95.4	0.0500	0.22
26	DEWMA	232.92	89.8	0.5000	0.22
27	EWMA	233.28	90.0	0.0050	0.22
28	EWMA	234.05	88.6	0.3000	0.22
29	at	234.55	88.2	0.2000	0.22
30	DEWMA	234.74	90.0	0.0100	0.22
31	Ft	234.77	88.0	0.2000	0.22
32	EWMA	240.18	82.0	0.5000	0.22
33	bt	241.69	80.4	0.1000	0.22
34	at	242.37	79.3	0.3000	0.22
35	Ft	242.71	78.9	0.3000	0.22
36	at	246.17	74.3	0.5000	0.22
37	DEWMA	247.90	73.2	0.0050	0.22
38	Shewhart	247.98	71.7	0.5000	0.22
39	Shewhart	248.48	70.9	0.2000	0.22
40	Shewhart	249.10	70.0	0.0010	0.22
41	Shewhart	249.30	69.6	0.0500	0.22
42	Shewhart	249.63	69.3	0.1000	0.22
43	Shewhart	249.85	68.8	0.3000	0.22
44	Shewhart	249.92	68.7	0.0100	0.22
45	Shewhart	250.21	68.3	0.0005	0.22
46	Shewhart	250.75	67.3	0.0050	0.22
47	bt	251.60	66.4	0.2000	0.22
48	bt	257.36	55.6	0.3000	0.22
49	bt	257.90	54.4	0.5000	0.22
50	EWMA	258.49	53.2	0.0010	0.22
51	EWMA	267.47	25.3	0.0005	0.22
52	Ft	269.28	13.6	0.5000	0.22
53	DEWMA	270.00	0.0	0.0005	0.22
54	DEWMA	270.00	0.0	0.0010	0.22

Table D4-24

	Chart	ARL1	SD	Lambda
1	Ft	202.62	114.2	0.0010
2	Ft	202.77	114.4	0.0005
3	at	203.09	114.2	0.0005
4	at	203.98	113.5	0.0010
5	bt	204.66	113.2	0.0005
6	bt	205.49	112.5	0.0010
7	Ft	213.87	106.2	0.0050
8	EWMA	215.01	104.4	0.0500
9	at	215.13	105.4	0.0050
10	bt	215.35	104.4	0.0100
11	Ft	215.42	104.2	0.0500
12	at	216.36	103.5	0.0500
13	DEWMA	216.47	103.3	0.1000
14	DEWMA	216.84	103.1	0.2000
15	Ft	217.14	103.2	0.0100
16	at	217.50	103.0	0.0100
17	bt	218.41	102.6	0.0050
18	EWMA	218.73	101.8	0.1000
19	EWMA	220.64	100.4	0.2000
20	DEWMA	223.90	97.9	0.3000
21	DEWMA	224.37	97.6	0.0500
22	Ft	224.44	97.5	0.1000
23	at	225.59	96.5	0.1000
24	bt	226.35	95.9	0.0500
25	EWMA	228.00	94.7	0.0100
26	DEWMA	232.34	90.5	0.5000
27	EWMA	232.71	90.6	0.0050
28	EWMA	233.66	89.0	0.3000
29	at	235.58	87.0	0.2000
30	DEWMA	235.96	88.6	0.0100
31	Ft	236.86	85.7	0.2000
32	EWMA	239.46	82.8	0.5000
33	bt	241.58	80.6	0.1000
34	at	242.59	79.1	0.3000
35	Ft	243.49	78.0	0.3000
36	at	246.96	73.2	0.5000
37	DEWMA	247.22	74.3	0.0050
38	Shewhart	248.38	71.1	0.0050
39	Shewhart	248.81	70.4	0.2000
40	Shewhart	248.87	70.3	0.0005
41	Shewhart	249.46	69.4	0.0100
42	Shewhart	249.91	68.6	0.0500
43	Shewhart	249.99	68.6	0.0010
44	Shewhart	250.10	68.5	0.3000
45	Shewhart	250.22	68.2	0.1000
46	Shewhart	250.29	68.1	0.5000
47	bt	254.06	62.0	0.2000
48	bt	256.70	57.0	0.3000
49	EWMA	258.64	52.8	0.0010
50	bt	258.76	52.6	0.5000
51	EWMA	266.96	27.7	0.0005
52	Ft	269.44	11.9	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-25

Average running length under shift = 0.23

	Chart	ARL1	SD	Lambda	shift
1	Ft	200.54	115.6	0.0005	0.23
2	at	200.66	115.5	0.0005	0.23
3	Ft	201.21	115.0	0.0010	0.23
4	bt	201.88	114.8	0.0005	0.23
5	at	202.16	114.5	0.0010	0.23
6	bt	203.65	113.5	0.0010	0.23
7	EWMA	210.56	107.2	0.0500	0.23
8	bt	210.61	107.5	0.0100	0.23
9	Ft	210.98	107.0	0.0500	0.23
10	Ft	211.90	106.8	0.0100	0.23
11	Ft	212.05	107.4	0.0050	0.23
12	DEWMA	212.32	105.9	0.1000	0.23
13	at	212.36	106.5	0.0100	0.23
14	at	212.63	106.0	0.0500	0.23
15	at	213.17	106.6	0.0050	0.23
16	DEWMA	215.61	104.0	0.2000	0.23
17	EWMA	215.86	103.8	0.1000	0.23
18	bt	216.40	104.0	0.0050	0.23
19	EWMA	219.32	101.5	0.2000	0.23
20	DEWMA	221.57	99.6	0.3000	0.23
21	DEWMA	222.00	99.3	0.0500	0.23
22	Ft	222.56	99.0	0.1000	0.23
23	at	222.67	98.9	0.1000	0.23
24	EWMA	223.63	98.4	0.0100	0.23
25	bt	223.67	98.2	0.0500	0.23
26	EWMA	230.49	92.8	0.0050	0.23
27	EWMA	231.98	90.6	0.3000	0.23
28	DEWMA	232.06	90.6	0.5000	0.23
29	at	234.72	88.0	0.2000	0.23
30	DEWMA	235.63	88.9	0.0100	0.23
31	Ft	235.73	87.0	0.2000	0.23
32	bt	240.02	82.5	0.1000	0.23
33	EWMA	240.16	81.9	0.5000	0.23
34	at	240.72	81.2	0.3000	0.23
35	Ft	241.57	80.3	0.3000	0.23
36	at	246.43	73.9	0.5000	0.23
37	DEWMA	246.66	75.1	0.0050	0.23
38	Shewhart	248.37	71.1	0.0010	0.23
39	Shewhart	248.54	70.8	0.0500	0.23
40	Shewhart	248.66	70.7	0.0005	0.23
41	Shewhart	248.70	70.6	0.0050	0.23
42	Shewhart	248.95	70.2	0.5000	0.23
43	Shewhart	249.04	70.1	0.1000	0.23
44	Shewhart	249.57	69.2	0.3000	0.23
45	Shewhart	250.12	68.4	0.0100	0.23
46	Shewhart	250.14	68.4	0.2000	0.23
47	bt	253.82	62.7	0.2000	0.23
48	bt	256.14	58.1	0.3000	0.23
49	EWMA	256.62	57.1	0.0010	0.23
50	bt	259.62	50.5	0.5000	0.23
51	EWMA	266.66	29.0	0.0005	0.23
52	Ft	269.50	11.3	0.5000	0.23
53	DEWMA	270.00	0.0	0.0005	0.23
54	DEWMA	270.00	0.0	0.0010	0.23

Table D4-25

	Chart	ARL1	SD	Lambda
1	Ft	198.06	116.9	0.0005
2	at	198.45	116.7	0.0005
3	bt	199.57	116.0	0.0005
4	Ft	202.74	114.3	0.0010
5	at	203.67	113.7	0.0010
6	bt	204.93	112.8	0.0010
7	bt	209.41	108.3	0.0100
8	at	209.84	108.2	0.0100
9	Ft	210.20	108.0	0.0100
10	DEWMA	210.33	107.3	0.1000
11	Ft	211.71	106.6	0.0500
12	EWMA	212.00	106.4	0.1000
13	EWMA	212.30	106.1	0.0500
14	at	212.51	106.0	0.0500
15	Ft	212.71	106.9	0.0050
16	at	213.82	106.2	0.0050
17	DEWMA	215.43	104.2	0.2000
18	bt	216.34	104.0	0.0050
19	Ft	218.79	102.0	0.1000
20	at	219.27	101.5	0.1000
21	EWMA	219.43	101.4	0.2000
22	EWMA	220.92	100.6	0.0100
23	bt	221.88	99.6	0.0500
24	DEWMA	221.97	99.5	0.3000
25	DEWMA	223.32	98.3	0.0500
26	EWMA	230.46	92.2	0.3000
27	EWMA	230.58	92.7	0.0050
28	DEWMA	232.19	90.6	0.5000
29	DEWMA	234.17	90.4	0.0100
30	at	235.71	86.9	0.2000
31	Ft	235.76	86.9	0.2000
32	bt	238.15	84.6	0.1000
33	EWMA	239.15	83.2	0.5000
34	at	240.26	81.9	0.3000
35	Ft	240.59	81.5	0.3000
36	at	245.98	74.6	0.5000
37	DEWMA	246.09	75.9	0.0050
38	Shewhart	248.04	71.6	0.3000
39	Shewhart	248.38	71.1	0.0100
40	Shewhart	248.98	70.1	0.0010
41	Shewhart	249.45	69.5	0.5000
42	Shewhart	249.54	69.3	0.2000
43	Shewhart	249.55	69.4	0.0500
44	Shewhart	249.66	69.1	0.0005
45	Shewhart	249.94	68.7	0.1000
46	Shewhart	250.95	67.1	0.0050
47	bt	253.33	63.5	0.2000
48	bt	256.04	58.4	0.3000
49	EWMA	258.53	53.1	0.0010
50	bt	258.92	52.2	0.5000
51	EWMA	266.70	28.9	0.0005
52	Ft	269.51	11.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-26

Average running length under shift = 0.24

	Chart	ARL1	SD	Lambda	shift
1	Ft	198.12	116.7	0.0005	0.24
2	at	198.35	116.6	0.0005	0.24
3	bt	199.58	115.9	0.0005	0.24
4	Ft	200.80	115.3	0.0010	0.24
5	at	201.73	114.7	0.0010	0.24
6	bt	203.07	113.9	0.0010	0.24
7	EWMA	207.60	108.9	0.0500	0.24
8	Ft	208.62	108.3	0.0500	0.24
9	Ft	208.69	109.4	0.0050	0.24
10	DEWMA	209.02	108.2	0.2000	0.24
11	DEWMA	209.14	107.9	0.1000	0.24
12	at	209.70	108.8	0.0050	0.24
13	at	209.75	107.7	0.0500	0.24
14	bt	209.99	107.8	0.0100	0.24
15	Ft	210.98	107.3	0.0100	0.24
16	at	211.37	107.1	0.0100	0.24
17	EWMA	212.04	106.3	0.1000	0.24
18	bt	212.68	106.5	0.0050	0.24
19	EWMA	213.93	105.4	0.2000	0.24
20	DEWMA	218.64	101.9	0.3000	0.24
21	DEWMA	219.03	101.5	0.0500	0.24
22	Ft	219.06	101.8	0.1000	0.24
23	at	220.00	101.0	0.1000	0.24
24	bt	221.77	99.6	0.0500	0.24
25	EWMA	223.39	98.5	0.0100	0.24
26	EWMA	229.32	93.8	0.0050	0.24
27	EWMA	229.40	93.1	0.3000	0.24
28	DEWMA	230.85	91.8	0.5000	0.24
29	at	232.20	90.6	0.2000	0.24
30	Ft	232.43	90.5	0.2000	0.24
31	DEWMA	235.07	89.4	0.0100	0.24
32	EWMA	237.88	84.6	0.5000	0.24
33	bt	240.15	82.3	0.1000	0.24
34	at	240.31	81.8	0.3000	0.24
35	Ft	241.32	80.6	0.3000	0.24
36	at	245.11	75.7	0.5000	0.24
37	DEWMA	246.46	75.4	0.0050	0.24
38	Shewhart	247.54	72.3	0.2000	0.24
39	Shewhart	247.76	72.0	0.1000	0.24
40	Shewhart	248.21	71.4	0.0005	0.24
41	Shewhart	248.26	71.2	0.3000	0.24
42	Shewhart	248.34	71.0	0.0010	0.24
43	Shewhart	248.59	70.7	0.5000	0.24
44	Shewhart	248.67	70.7	0.0100	0.24
45	Shewhart	248.94	70.2	0.0500	0.24
46	Shewhart	249.16	69.9	0.0050	0.24
47	bt	252.83	64.4	0.2000	0.24
48	bt	256.44	57.5	0.3000	0.24
49	EWMA	257.00	56.4	0.0010	0.24
50	bt	258.88	52.2	0.5000	0.24
51	EWMA	266.73	28.7	0.0005	0.24
52	Ft	269.47	11.6	0.5000	0.24
53	DEWMA	270.00	0.0	0.0005	0.24
54	DEWMA	270.00	0.0	0.0010	0.24

Table D4-26

	Chart	ARL1	SD	Lambda
1	Ft	197.82	116.9	0.0005
2	at	198.44	116.6	0.0005
3	bt	199.47	116.0	0.0005
4	Ft	199.99	115.7	0.0010
5	at	201.02	115.2	0.0010
6	bt	202.09	114.4	0.0010
7	Ft	208.01	108.8	0.0500
8	EWMA	208.24	108.6	0.0500
9	bt	208.83	108.5	0.0100
10	Ft	208.84	109.3	0.0050
11	at	209.20	108.0	0.0500
12	DEWMA	209.82	107.9	0.2000
13	at	210.00	108.6	0.0050
14	at	210.11	107.9	0.0100
15	DEWMA	210.34	107.1	0.1000
16	Ft	210.49	107.7	0.0100
17	EWMA	212.41	106.0	0.1000
18	bt	212.69	106.4	0.0050
19	EWMA	214.67	104.9	0.2000
20	DEWMA	218.83	101.9	0.3000
21	Ft	219.16	101.6	0.1000
22	DEWMA	219.80	100.9	0.0500
23	at	220.37	100.7	0.1000
24	bt	221.43	99.9	0.0500
25	EWMA	221.91	99.8	0.0100
26	EWMA	229.17	94.0	0.0050
27	EWMA	229.93	92.7	0.3000
28	DEWMA	231.47	91.2	0.5000
29	at	231.68	91.2	0.2000
30	Ft	232.10	90.8	0.2000
31	DEWMA	233.38	91.3	0.0100
32	EWMA	238.50	83.9	0.5000
33	at	239.14	83.2	0.3000
34	bt	239.52	83.0	0.1000
35	Ft	240.18	82.1	0.3000
36	at	244.23	76.9	0.5000
37	DEWMA	246.76	74.9	0.0050
38	Shewhart	247.48	72.4	0.0050
39	Shewhart	247.79	71.9	0.2000
40	Shewhart	248.08	71.5	0.5000
41	Shewhart	248.09	71.6	0.3000
42	Shewhart	248.17	71.4	0.0010
43	Shewhart	248.22	71.3	0.0005
44	Shewhart	248.98	70.2	0.0500
45	Shewhart	249.63	69.2	0.1000
46	Shewhart	250.44	67.9	0.0100
47	bt	251.88	66.0	0.2000
48	bt	255.04	60.3	0.3000
49	EWMA	257.25	55.9	0.0010
50	bt	259.03	51.9	0.5000
51	EWMA	266.22	30.8	0.0005
52	Ft	269.31	13.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-27

Average running length under shift = 0.25

	Chart	ARL1	SD	Lambda	shift
1	Ft	197.68	116.9	0.0005	0.25
2	at	197.79	116.8	0.0005	0.25
3	bt	198.76	116.2	0.0005	0.25
4	Ft	198.76	116.2	0.0010	0.25
5	at	199.90	115.6	0.0010	0.25
6	bt	201.86	114.4	0.0010	0.25
7	EWMA	202.55	111.8	0.0500	0.25
8	Ft	204.17	111.0	0.0500	0.25
9	at	204.60	110.7	0.0500	0.25
10	DEWMA	205.16	110.2	0.1000	0.25
11	bt	205.65	110.3	0.0100	0.25
12	Ft	206.23	110.9	0.0050	0.25
13	DEWMA	207.49	109.2	0.2000	0.25
14	at	207.60	110.1	0.0050	0.25
15	bt	207.96	109.4	0.0050	0.25
16	at	208.40	108.9	0.0100	0.25
17	EWMA	208.49	108.6	0.1000	0.25
18	Ft	208.98	108.7	0.0100	0.25
19	EWMA	212.15	106.5	0.2000	0.25
20	DEWMA	216.29	103.6	0.0500	0.25
21	Ft	216.30	103.7	0.1000	0.25
22	DEWMA	216.62	103.4	0.3000	0.25
23	at	217.87	102.5	0.1000	0.25
24	bt	219.18	101.7	0.0500	0.25
25	EWMA	220.32	101.0	0.0100	0.25
26	EWMA	226.98	96.0	0.0050	0.25
27	EWMA	227.57	94.8	0.3000	0.25
28	DEWMA	228.33	94.2	0.5000	0.25
29	at	230.37	92.3	0.2000	0.25
30	Ft	231.22	91.6	0.2000	0.25
31	DEWMA	233.13	91.5	0.0100	0.25
32	EWMA	236.28	86.3	0.5000	0.25
33	bt	237.96	84.8	0.1000	0.25
34	at	238.51	84.0	0.3000	0.25
35	Ft	238.75	83.7	0.3000	0.25
36	at	243.90	77.3	0.5000	0.25
37	DEWMA	246.08	75.9	0.0050	0.25
38	Shewhart	247.16	72.9	0.0050	0.25
39	Shewhart	247.17	72.8	0.0005	0.25
40	Shewhart	247.35	72.6	0.0500	0.25
41	Shewhart	247.55	72.3	0.0100	0.25
42	Shewhart	247.79	71.9	0.5000	0.25
43	Shewhart	247.86	71.8	0.2000	0.25
44	Shewhart	248.23	71.4	0.1000	0.25
45	Shewhart	248.33	71.2	0.0010	0.25
46	Shewhart	248.50	70.8	0.3000	0.25
47	bt	252.01	65.8	0.2000	0.25
48	bt	255.97	58.5	0.3000	0.25
49	EWMA	257.48	55.4	0.0010	0.25
50	bt	258.76	52.6	0.5000	0.25
51	EWMA	266.67	29.0	0.0005	0.25
52	Ft	269.51	11.2	0.5000	0.25
53	DEWMA	270.00	0.0	0.0005	0.25
54	DEWMA	270.00	0.0	0.0010	0.25

Table D4-27

	Chart	ARL1	SD	Lambda
1	Ft	197.98	116.7	0.0005
2	at	198.25	116.5	0.0005
3	Ft	199.49	115.8	0.0010
4	bt	199.53	115.8	0.0005
5	at	200.91	115.0	0.0010
6	bt	202.19	114.2	0.0010
7	DEWMA	204.31	110.7	0.1000
8	EWMA	204.54	110.7	0.0500
9	Ft	204.73	110.7	0.0500
10	at	205.18	110.4	0.0500
11	Ft	205.91	111.1	0.0050
12	bt	206.83	109.7	0.0100
13	at	207.22	110.3	0.0050
14	Ft	207.33	109.5	0.0100
15	EWMA	207.52	109.1	0.1000
16	at	207.58	109.4	0.0100
17	bt	208.56	108.9	0.0050
18	DEWMA	208.59	108.5	0.2000
19	EWMA	212.50	106.3	0.2000
20	DEWMA	214.45	104.9	0.3000
21	DEWMA	216.73	103.2	0.0500
22	Ft	218.17	102.4	0.1000
23	bt	218.55	102.1	0.0500
24	at	218.71	101.9	0.1000
25	EWMA	221.17	100.3	0.0100
26	EWMA	226.46	95.8	0.3000
27	EWMA	226.86	96.1	0.0050
28	DEWMA	228.44	94.1	0.5000
29	at	231.25	91.5	0.2000
30	Ft	231.70	91.1	0.2000
31	DEWMA	234.51	90.0	0.0100
32	EWMA	236.84	85.7	0.5000
33	at	237.30	85.3	0.3000
34	bt	237.79	85.0	0.1000
35	Ft	239.20	83.1	0.3000
36	at	243.91	77.3	0.5000
37	DEWMA	245.23	77.1	0.0050
38	Shewhart	247.07	73.0	0.0010
39	Shewhart	247.57	72.3	0.0005
40	Shewhart	247.70	72.0	0.2000
41	Shewhart	248.04	71.5	0.0100
42	Shewhart	248.17	71.4	0.0050
43	Shewhart	248.17	71.4	0.1000
44	Shewhart	248.18	71.4	0.0500
45	Shewhart	248.26	71.2	0.3000
46	Shewhart	248.30	71.3	0.5000
47	bt	253.11	63.8	0.2000
48	bt	256.22	58.0	0.3000
49	EWMA	256.98	56.3	0.0010
50	bt	258.24	53.7	0.5000
51	EWMA	266.67	28.9	0.0005
52	Ft	269.43	12.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-28

Average running length under shift = 0.26

	Chart	ARL1	SD	Lambda	shift
1	Ft	197.00	117.0	0.0010	0.26
2	Ft	197.48	116.9	0.0005	0.26
3	at	197.58	116.9	0.0005	0.26
4	at	198.23	116.3	0.0010	0.26
5	bt	198.57	116.3	0.0005	0.26
6	bt	199.82	115.4	0.0010	0.26
7	EWMA	201.15	112.5	0.0500	0.26
8	Ft	201.40	112.5	0.0500	0.26
9	at	202.41	112.0	0.0500	0.26
10	DEWMA	202.71	111.7	0.2000	0.26
11	bt	203.17	111.7	0.0100	0.26
12	DEWMA	203.39	111.2	0.1000	0.26
13	EWMA	205.44	110.3	0.1000	0.26
14	Ft	205.83	111.1	0.0050	0.26
15	Ft	206.02	110.3	0.0100	0.26
16	at	206.45	110.0	0.0100	0.26
17	at	206.61	110.6	0.0050	0.26
18	bt	208.52	109.1	0.0050	0.26
19	EWMA	208.88	108.5	0.2000	0.26
20	DEWMA	212.46	106.2	0.3000	0.26
21	at	214.31	105.1	0.1000	0.26
22	Ft	214.42	105.1	0.1000	0.26
23	DEWMA	215.03	104.4	0.0500	0.26
24	bt	215.87	104.1	0.0500	0.26
25	EWMA	219.49	101.6	0.0100	0.26
26	DEWMA	224.03	98.0	0.5000	0.26
27	EWMA	225.26	96.9	0.3000	0.26
28	EWMA	226.81	96.0	0.0050	0.26
29	at	229.19	93.4	0.2000	0.26
30	Ft	229.82	92.9	0.2000	0.26
31	EWMA	234.18	88.7	0.5000	0.26
32	DEWMA	234.61	90.0	0.0100	0.26
33	bt	236.10	87.0	0.1000	0.26
34	at	237.37	85.3	0.3000	0.26
35	Ft	239.04	83.5	0.3000	0.26
36	at	243.21	78.3	0.5000	0.26
37	Shewhart	245.84	74.7	0.2000	0.26
38	Shewhart	245.98	74.6	0.0050	0.26
39	Shewhart	246.47	73.8	0.0005	0.26
40	DEWMA	246.82	74.8	0.0050	0.26
41	Shewhart	247.01	73.0	0.0100	0.26
42	Shewhart	247.32	72.5	0.0500	0.26
43	Shewhart	247.33	72.6	0.0010	0.26
44	Shewhart	247.76	72.0	0.3000	0.26
45	Shewhart	247.96	71.7	0.1000	0.26
46	Shewhart	248.13	71.4	0.5000	0.26
47	bt	252.49	64.9	0.2000	0.26
48	bt	256.11	58.3	0.3000	0.26
49	EWMA	256.90	56.4	0.0010	0.26
50	bt	258.52	53.1	0.5000	0.26
51	EWMA	266.54	29.5	0.0005	0.26
52	Ft	269.39	12.4	0.5000	0.26
53	DEWMA	270.00	0.0	0.0005	0.26
54	DEWMA	270.00	0.0	0.0010	0.26

Table D4-28

	Chart	ARL1	SD	Lambda
1	Ft	194.88	118.0	0.0010
2	Ft	195.79	117.8	0.0005
3	at	195.94	117.7	0.0005
4	at	196.06	117.4	0.0010
5	bt	196.93	117.2	0.0005
6	bt	197.18	116.7	0.0010
7	DEWMA	200.17	112.8	0.1000
8	bt	201.12	112.7	0.0100
9	Ft	201.18	112.6	0.0500
10	EWMA	201.19	112.5	0.0500
11	at	201.56	112.4	0.0500
12	Ft	202.69	111.9	0.0100
13	at	203.00	111.8	0.0100
14	EWMA	203.59	111.3	0.1000
15	DEWMA	204.29	111.0	0.2000
16	Ft	206.21	110.8	0.0050
17	at	207.19	110.2	0.0050
18	bt	210.09	108.0	0.0050
19	EWMA	210.36	107.7	0.2000
20	DEWMA	211.13	107.2	0.3000
21	Ft	211.41	107.1	0.1000
22	at	212.54	106.3	0.1000
23	DEWMA	213.59	105.3	0.0500
24	bt	216.19	103.8	0.0500
25	EWMA	217.72	102.7	0.0100
26	EWMA	224.44	97.6	0.3000
27	DEWMA	225.60	96.6	0.5000
28	EWMA	227.52	95.4	0.0050
29	Ft	230.35	92.5	0.2000
30	at	230.58	92.2	0.2000
31	EWMA	234.99	87.7	0.5000
32	bt	235.42	87.7	0.1000
33	DEWMA	235.49	88.9	0.0100
34	at	235.78	87.0	0.3000
35	Ft	237.08	85.6	0.3000
36	at	243.99	77.2	0.5000
37	Shewhart	245.81	74.8	0.3000
38	Shewhart	246.24	74.2	0.0010
39	Shewhart	246.78	73.3	0.1000
40	DEWMA	246.88	74.7	0.0050
41	Shewhart	246.99	73.1	0.0100
42	Shewhart	247.24	72.7	0.0005
43	Shewhart	247.32	72.6	0.0500
44	Shewhart	247.49	72.5	0.2000
45	Shewhart	247.68	72.1	0.0050
46	Shewhart	248.02	71.6	0.5000
47	bt	251.21	67.2	0.2000
48	bt	255.27	59.9	0.3000
49	EWMA	256.46	57.4	0.0010
50	bt	259.33	51.3	0.5000
51	EWMA	266.63	29.0	0.0005
52	Ft	269.62	9.8	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-29

Average running length under shift = 0.27

	Chart	ARL1	SD	Lambda	shift
1	Ft	192.80	119.2	0.0005	0.27
2	at	192.87	119.1	0.0005	0.27
3	bt	193.96	118.5	0.0005	0.27
4	DEWMA	195.50	115.1	0.1000	0.27
5	bt	196.26	115.1	0.0100	0.27
6	Ft	196.87	114.7	0.0500	0.27
7	Ft	197.12	117.0	0.0010	0.27
8	EWMA	197.75	114.3	0.1000	0.27
9	at	198.15	114.0	0.0500	0.27
10	at	198.21	116.4	0.0010	0.27
11	EWMA	198.22	113.9	0.0500	0.27
12	at	198.78	114.1	0.0100	0.27
13	Ft	199.02	114.0	0.0100	0.27
14	bt	199.59	115.6	0.0010	0.27
15	DEWMA	200.79	112.9	0.2000	0.27
16	Ft	203.34	112.3	0.0050	0.27
17	at	204.49	111.7	0.0050	0.27
18	Ft	206.92	109.8	0.1000	0.27
19	bt	207.32	109.7	0.0050	0.27
20	at	207.77	109.2	0.1000	0.27
21	EWMA	207.96	109.1	0.2000	0.27
22	DEWMA	209.28	108.3	0.3000	0.27
23	bt	211.05	107.4	0.0500	0.27
24	EWMA	212.46	106.5	0.0100	0.27
25	DEWMA	213.25	105.5	0.0500	0.27
26	EWMA	222.27	99.3	0.3000	0.27
27	DEWMA	222.95	98.8	0.5000	0.27
28	EWMA	224.42	98.0	0.0050	0.27
29	at	228.66	93.9	0.2000	0.27
30	Ft	229.15	93.5	0.2000	0.27
31	DEWMA	232.56	92.0	0.0100	0.27
32	EWMA	232.76	90.0	0.5000	0.27
33	bt	233.25	89.9	0.1000	0.27
34	at	235.36	87.4	0.3000	0.27
35	Ft	235.76	87.0	0.3000	0.27
36	at	242.21	79.5	0.5000	0.27
37	DEWMA	245.44	76.8	0.0050	0.27
38	Shewhart	245.45	75.3	0.3000	0.27
39	Shewhart	245.98	74.6	0.0100	0.27
40	Shewhart	246.11	74.3	0.0010	0.27
41	Shewhart	246.86	73.3	0.2000	0.27
42	Shewhart	247.00	73.1	0.0500	0.27
43	Shewhart	247.15	72.9	0.1000	0.27
44	Shewhart	247.31	72.7	0.5000	0.27
45	Shewhart	247.52	72.3	0.0005	0.27
46	Shewhart	248.43	71.0	0.0050	0.27
47	bt	252.16	65.6	0.2000	0.27
48	bt	255.06	60.3	0.3000	0.27
49	EWMA	256.57	57.0	0.0010	0.27
50	bt	258.65	52.8	0.5000	0.27
51	EWMA	266.08	31.3	0.0005	0.27
52	Ft	269.49	11.5	0.5000	0.27
53	DEWMA	270.00	0.0	0.0005	0.27
54	DEWMA	270.00	0.0	0.0010	0.27

Table D4-29

	Chart	ARL1	SD	Lambda
1	Ft	194.69	118.1	0.0010
2	Ft	195.18	118.1	0.0005
3	at	195.69	117.6	0.0010
4	at	195.93	117.7	0.0005
5	DEWMA	196.67	114.5	0.1000
6	bt	196.78	117.2	0.0005
7	bt	197.34	116.7	0.0010
8	EWMA	197.55	114.1	0.0500
9	Ft	197.96	114.0	0.0500
10	at	198.68	113.7	0.0500
11	bt	199.45	113.6	0.0100
12	at	201.90	112.5	0.0100
13	DEWMA	201.91	112.2	0.2000
14	Ft	202.00	112.4	0.0100
15	EWMA	202.51	111.9	0.1000
16	Ft	203.30	112.5	0.0050
17	at	203.64	112.2	0.0050
18	bt	205.78	110.6	0.0050
19	EWMA	208.13	109.0	0.2000
20	DEWMA	209.54	108.1	0.3000
21	Ft	210.19	107.8	0.1000
22	at	211.43	107.0	0.1000
23	bt	213.64	105.6	0.0500
24	DEWMA	213.94	105.0	0.0500
25	EWMA	215.55	104.4	0.0100
26	EWMA	221.50	99.9	0.3000
27	DEWMA	223.89	98.0	0.5000
28	EWMA	224.72	97.9	0.0050
29	at	227.40	95.0	0.2000
30	Ft	227.67	94.8	0.2000
31	EWMA	233.40	89.4	0.5000
32	at	234.12	88.7	0.3000
33	DEWMA	234.60	89.9	0.0100
34	Ft	235.15	87.7	0.3000
35	bt	236.04	87.0	0.1000
36	at	242.83	78.7	0.5000
37	DEWMA	245.45	76.7	0.0050
38	Shewhart	245.87	74.6	0.0500
39	Shewhart	245.99	74.5	0.1000
40	Shewhart	246.13	74.3	0.0050
41	Shewhart	246.43	73.8	0.5000
42	Shewhart	246.46	73.9	0.0005
43	Shewhart	246.61	73.6	0.0100
44	Shewhart	246.66	73.5	0.2000
45	Shewhart	247.23	72.8	0.3000
46	Shewhart	248.04	71.7	0.0010
47	bt	250.24	68.7	0.2000
48	bt	255.85	58.8	0.3000
49	EWMA	256.17	57.8	0.0010
50	bt	258.01	54.1	0.5000
51	EWMA	265.88	32.1	0.0005
52	Ft	269.39	12.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-30

Average running length under shift = 0.28

	Chart	ARL1	SD	Lambda	shift
1	Ft	192.56	119.2	0.0005	0.28
2	at	192.79	119.1	0.0005	0.28
3	EWMA	192.96	116.2	0.0500	0.28
4	Ft	193.44	116.1	0.0500	0.28
5	bt	193.80	118.6	0.0005	0.28
6	Ft	194.00	118.5	0.0010	0.28
7	at	194.05	115.8	0.0500	0.28
8	at	195.17	117.9	0.0010	0.28
9	DEWMA	195.52	115.4	0.2000	0.28
10	DEWMA	195.71	114.7	0.1000	0.28
11	bt	195.72	115.3	0.0100	0.28
12	bt	196.61	117.1	0.0010	0.28
13	EWMA	197.31	114.4	0.1000	0.28
14	at	198.39	114.2	0.0100	0.28
15	Ft	198.46	114.2	0.0100	0.28
16	Ft	200.02	114.1	0.0050	0.28
17	at	200.82	113.6	0.0050	0.28
18	bt	202.21	112.4	0.0050	0.28
19	EWMA	202.68	112.2	0.2000	0.28
20	DEWMA	206.84	109.8	0.3000	0.28
21	Ft	207.14	109.6	0.1000	0.28
22	at	207.98	109.1	0.1000	0.28
23	DEWMA	209.31	107.9	0.0500	0.28
24	bt	210.70	107.5	0.0500	0.28
25	EWMA	212.59	106.4	0.0100	0.28
26	EWMA	220.53	100.7	0.3000	0.28
27	EWMA	222.73	99.4	0.0050	0.28
28	DEWMA	223.42	98.4	0.5000	0.28
29	at	224.65	97.5	0.2000	0.28
30	Ft	225.30	97.0	0.2000	0.28
31	DEWMA	231.96	92.6	0.0100	0.28
32	EWMA	233.11	89.7	0.5000	0.28
33	at	233.24	89.6	0.3000	0.28
34	bt	233.83	89.3	0.1000	0.28
35	Ft	235.39	87.5	0.3000	0.28
36	at	240.89	81.1	0.5000	0.28
37	Shewhart	244.98	75.9	0.0050	0.28
38	Shewhart	245.10	75.8	0.3000	0.28
39	Shewhart	245.20	75.6	0.2000	0.28
40	Shewhart	245.62	75.0	0.0010	0.28
41	Shewhart	245.64	75.0	0.5000	0.28
42	Shewhart	245.78	74.8	0.0005	0.28
43	DEWMA	246.24	75.6	0.0050	0.28
44	Shewhart	246.65	73.6	0.0500	0.28
45	Shewhart	246.91	73.3	0.1000	0.28
46	Shewhart	248.12	71.4	0.0100	0.28
47	bt	250.19	68.8	0.2000	0.28
48	bt	254.32	61.7	0.3000	0.28
49	EWMA	254.98	60.2	0.0010	0.28
50	bt	258.73	52.6	0.5000	0.28
51	EWMA	265.69	32.9	0.0005	0.28
52	Ft	269.28	13.6	0.5000	0.28
53	DEWMA	270.00	0.0	0.0005	0.28
54	DEWMA	270.00	0.0	0.0010	0.28

Table D4-30

	Chart	ARL1	SD	Lambda
1	Ft	191.28	119.8	0.0005
2	at	191.61	119.6	0.0005
3	DEWMA	191.94	116.4	0.1000
4	Ft	192.64	118.9	0.0010
5	bt	192.74	119.0	0.0005
6	EWMA	193.55	115.9	0.0500
7	Ft	193.59	116.1	0.0500
8	DEWMA	194.01	115.9	0.2000
9	at	194.02	118.3	0.0010
10	at	194.24	115.7	0.0500
11	bt	194.98	117.7	0.0010
12	bt	196.59	114.9	0.0100
13	EWMA	196.90	114.6	0.1000
14	Ft	197.48	114.6	0.0100
15	at	197.86	114.5	0.0100
16	Ft	201.11	113.6	0.0050
17	at	202.20	113.0	0.0050
18	EWMA	202.52	112.1	0.2000
19	bt	203.08	112.1	0.0050
20	DEWMA	206.19	110.0	0.3000
21	Ft	206.65	109.9	0.1000
22	at	206.66	109.8	0.1000
23	bt	209.90	108.0	0.0500
24	DEWMA	210.93	106.9	0.0500
25	EWMA	213.31	106.0	0.0100
26	EWMA	220.94	100.3	0.3000
27	DEWMA	220.99	100.3	0.5000
28	at	223.62	98.3	0.2000
29	EWMA	224.16	98.3	0.0050
30	Ft	224.58	97.6	0.2000
31	EWMA	231.81	90.9	0.5000
32	bt	233.17	90.1	0.1000
33	DEWMA	233.61	90.8	0.0100
34	at	234.76	88.0	0.3000
35	Ft	236.48	86.2	0.3000
36	at	241.50	80.4	0.5000
37	Shewhart	245.19	75.6	0.2000
38	Shewhart	245.22	75.6	0.0100
39	Shewhart	245.28	75.5	0.0050
40	Shewhart	245.88	74.6	0.0010
41	Shewhart	246.15	74.3	0.0500
42	Shewhart	246.33	74.0	0.3000
43	Shewhart	246.34	74.0	0.5000
44	DEWMA	246.40	75.5	0.0050
45	Shewhart	246.62	73.7	0.0005
46	Shewhart	246.95	73.1	0.1000
47	bt	250.90	67.6	0.2000
48	EWMA	254.08	61.8	0.0010
49	bt	255.63	59.2	0.3000
50	bt	258.29	53.6	0.5000
51	EWMA	265.77	32.6	0.0005
52	Ft	269.31	13.2	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-31

Average running length under shift = 0.29

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	188.68	117.8	0.1000	0.29
2	EWMA	189.36	117.7	0.0500	0.29
3	Ft	189.42	117.8	0.0500	0.29
4	at	189.65	117.7	0.0500	0.29
5	Ft	192.27	119.2	0.0005	0.29
6	EWMA	192.31	116.6	0.1000	0.29
7	at	192.80	118.9	0.0005	0.29
8	DEWMA	193.24	116.4	0.2000	0.29
9	Ft	193.25	118.6	0.0010	0.29
10	bt	193.37	116.3	0.0100	0.29
11	bt	193.98	118.3	0.0005	0.29
12	at	194.92	117.8	0.0010	0.29
13	bt	195.77	117.3	0.0010	0.29
14	Ft	195.81	115.4	0.0100	0.29
15	Ft	195.84	116.1	0.0050	0.29
16	at	196.02	115.3	0.0100	0.29
17	at	196.47	115.7	0.0050	0.29
18	bt	197.40	114.7	0.0050	0.29
19	EWMA	200.53	113.2	0.2000	0.29
20	DEWMA	203.25	111.8	0.3000	0.29
21	Ft	205.29	110.6	0.1000	0.29
22	at	205.80	110.3	0.1000	0.29
23	DEWMA	205.91	109.9	0.0500	0.29
24	bt	207.68	109.4	0.0500	0.29
25	EWMA	211.59	106.9	0.0100	0.29
26	EWMA	216.84	103.4	0.3000	0.29
27	DEWMA	219.54	101.4	0.5000	0.29
28	EWMA	220.38	101.2	0.0050	0.29
29	at	223.34	98.5	0.2000	0.29
30	Ft	223.72	98.3	0.2000	0.29
31	EWMA	230.39	92.3	0.5000	0.29
32	at	231.60	91.2	0.3000	0.29
33	bt	233.09	90.1	0.1000	0.29
34	DEWMA	233.38	91.1	0.0100	0.29
35	Ft	234.56	88.3	0.3000	0.29
36	at	240.37	81.7	0.5000	0.29
37	Shewhart	244.22	76.9	0.0010	0.29
38	DEWMA	244.73	77.7	0.0050	0.29
39	Shewhart	245.04	75.8	0.2000	0.29
40	Shewhart	245.07	75.8	0.0050	0.29
41	Shewhart	245.10	75.8	0.0005	0.29
42	Shewhart	245.28	75.4	0.0100	0.29
43	Shewhart	245.62	75.1	0.1000	0.29
44	Shewhart	245.75	74.9	0.0500	0.29
45	Shewhart	245.85	74.7	0.3000	0.29
46	Shewhart	245.95	74.6	0.5000	0.29
47	bt	251.87	66.0	0.2000	0.29
48	bt	255.18	60.0	0.3000	0.29
49	EWMA	255.30	59.6	0.0010	0.29
50	bt	257.95	54.4	0.5000	0.29
51	EWMA	266.05	31.4	0.0005	0.29
52	Ft	269.30	13.4	0.5000	0.29
53	DEWMA	270.00	0.0	0.0005	0.29
54	DEWMA	270.00	0.0	0.0010	0.29

Table D4-31

	Chart	ARL1	SD	Lambda
1	DEWMA	187.58	118.2	0.1000
2	EWMA	190.33	117.3	0.0500
3	EWMA	190.54	117.4	0.1000
4	Ft	190.74	120.0	0.0005
5	at	190.97	119.9	0.0005
6	Ft	191.93	116.9	0.0500
7	at	191.97	116.8	0.0500
8	bt	192.03	119.3	0.0005
9	DEWMA	192.15	116.7	0.2000
10	bt	194.72	115.7	0.0100
11	Ft	194.74	117.9	0.0010
12	at	196.35	117.1	0.0010
13	at	196.63	115.0	0.0100
14	Ft	196.95	115.5	0.0050
15	Ft	197.23	114.7	0.0100
16	bt	197.62	116.4	0.0010
17	at	198.25	114.8	0.0050
18	bt	199.20	114.0	0.0050
19	EWMA	199.70	113.6	0.2000
20	Ft	202.38	112.3	0.1000
21	at	203.08	111.8	0.1000
22	DEWMA	204.11	111.3	0.3000
23	DEWMA	207.43	109.0	0.0500
24	bt	207.93	109.2	0.0500
25	EWMA	211.65	106.9	0.0100
26	EWMA	217.09	103.3	0.3000
27	DEWMA	220.13	101.0	0.5000
28	EWMA	221.50	100.2	0.0050
29	at	221.84	99.7	0.2000
30	Ft	222.73	99.1	0.2000
31	EWMA	231.05	91.7	0.5000
32	at	231.54	91.3	0.3000
33	bt	232.62	90.6	0.1000
34	DEWMA	233.15	91.3	0.0100
35	Ft	233.15	89.8	0.3000
36	at	240.45	81.7	0.5000
37	Shewhart	243.92	77.2	0.0005
38	Shewhart	244.36	76.8	0.0050
39	Shewhart	244.52	76.5	0.2000
40	Shewhart	244.72	76.2	0.0500
41	Shewhart	245.01	75.9	0.5000
42	Shewhart	245.41	75.3	0.0010
43	Shewhart	245.58	75.0	0.3000
44	Shewhart	245.66	74.9	0.1000
45	Shewhart	246.17	74.3	0.0100
46	DEWMA	246.72	74.9	0.0050
47	bt	250.20	68.7	0.2000
48	bt	255.27	59.8	0.3000
49	EWMA	255.28	59.6	0.0010
50	bt	257.67	55.0	0.5000
51	EWMA	266.01	31.6	0.0005
52	Ft	269.29	13.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-32

Average running length under shift = 0.3

	Chart	ARL1	SD	Lambda	shift
1	EWMA	184.21	119.6	0.0500	0.3
2	DEWMA	184.75	119.2	0.1000	0.3
3	Ft	185.61	119.3	0.0500	0.3
4	at	186.25	119.0	0.0500	0.3
5	bt	187.16	118.7	0.0100	0.3
6	Ft	188.89	120.4	0.0010	0.3
7	EWMA	189.03	118.0	0.1000	0.3
8	DEWMA	189.11	118.1	0.2000	0.3
9	at	189.95	120.0	0.0010	0.3
10	at	190.10	117.6	0.0100	0.3
11	Ft	190.16	120.2	0.0005	0.3
12	at	190.28	120.1	0.0005	0.3
13	Ft	190.37	117.6	0.0100	0.3
14	bt	190.62	119.5	0.0010	0.3
15	bt	191.59	119.5	0.0005	0.3
16	Ft	197.49	115.3	0.0050	0.3
17	EWMA	197.82	114.6	0.2000	0.3
18	at	198.10	114.9	0.0050	0.3
19	DEWMA	198.49	114.2	0.3000	0.3
20	bt	198.52	114.2	0.0050	0.3
21	Ft	198.77	114.2	0.1000	0.3
22	at	199.98	113.5	0.1000	0.3
23	DEWMA	201.39	112.2	0.0500	0.3
24	bt	204.22	111.3	0.0500	0.3
25	EWMA	208.12	108.9	0.0100	0.3
26	EWMA	214.64	105.0	0.3000	0.3
27	DEWMA	216.77	103.5	0.5000	0.3
28	EWMA	220.51	101.0	0.0050	0.3
29	at	221.67	100.0	0.2000	0.3
30	Ft	222.24	99.6	0.2000	0.3
31	EWMA	228.28	94.3	0.5000	0.3
32	at	229.56	93.2	0.3000	0.3
33	bt	229.66	93.5	0.1000	0.3
34	Ft	231.86	91.1	0.3000	0.3
35	DEWMA	234.39	90.0	0.0100	0.3
36	at	240.10	82.1	0.5000	0.3
37	Shewhart	243.40	78.0	0.0010	0.3
38	Shewhart	243.47	77.9	0.3000	0.3
39	Shewhart	244.13	77.0	0.1000	0.3
40	Shewhart	244.21	76.9	0.0100	0.3
41	Shewhart	244.30	76.9	0.2000	0.3
42	Shewhart	244.37	76.7	0.0500	0.3
43	Shewhart	244.46	76.5	0.0005	0.3
44	Shewhart	245.00	75.9	0.0050	0.3
45	Shewhart	245.25	75.5	0.5000	0.3
46	DEWMA	246.37	75.4	0.0050	0.3
47	bt	249.61	69.8	0.2000	0.3
48	EWMA	254.03	61.9	0.0010	0.3
49	bt	254.66	61.1	0.3000	0.3
50	bt	259.09	51.8	0.5000	0.3
51	EWMA	265.91	31.9	0.0005	0.3
52	Ft	269.51	11.1	0.5000	0.3
53	DEWMA	270.00	0.0	0.0005	0.3
54	DEWMA	270.00	0.0	0.0010	0.3

Table D4-32

	Chart	ARL1	SD	Lambda
1	EWMA	183.05	119.9	0.0500
2	DEWMA	183.68	119.6	0.1000
3	Ft	186.47	118.9	0.0500
4	at	186.58	118.8	0.0500
5	EWMA	187.95	118.5	0.1000
6	bt	188.46	118.3	0.0100
7	Ft	189.45	118.0	0.0100
8	at	189.75	117.9	0.0100
9	Ft	190.59	119.7	0.0010
10	DEWMA	191.63	117.0	0.2000
11	at	191.98	119.1	0.0010
12	bt	192.70	118.6	0.0010
13	Ft	193.42	118.7	0.0005
14	Ft	193.53	117.1	0.0050
15	at	193.54	118.6	0.0005
16	bt	194.85	117.9	0.0005
17	at	194.93	116.5	0.0050
18	bt	196.42	115.3	0.0050
19	EWMA	198.57	114.2	0.2000
20	at	199.44	113.7	0.1000
21	DEWMA	199.59	113.6	0.3000
22	Ft	199.71	113.7	0.1000
23	DEWMA	202.62	111.6	0.0500
24	bt	205.55	110.6	0.0500
25	EWMA	206.47	110.0	0.0100
26	EWMA	215.10	104.6	0.3000
27	DEWMA	216.75	103.6	0.5000
28	EWMA	218.76	102.6	0.0050
29	at	221.27	100.2	0.2000
30	Ft	222.77	99.1	0.2000
31	EWMA	227.84	94.8	0.5000
32	bt	230.26	93.0	0.1000
33	at	231.04	91.8	0.3000
34	DEWMA	232.08	92.5	0.0100
35	Ft	232.92	90.0	0.3000
36	at	239.12	83.4	0.5000
37	Shewhart	243.76	77.6	0.5000
38	Shewhart	244.12	77.1	0.0005
39	Shewhart	244.17	77.0	0.2000
40	Shewhart	244.20	76.9	0.3000
41	Shewhart	244.28	76.9	0.0100
42	DEWMA	244.39	78.3	0.0050
43	Shewhart	245.28	75.5	0.0050
44	Shewhart	245.65	75.0	0.0500
45	Shewhart	245.99	74.5	0.1000
46	Shewhart	246.31	74.0	0.0010
47	bt	250.00	69.1	0.2000
48	EWMA	254.40	61.1	0.0010
49	bt	255.22	60.1	0.3000
50	bt	257.96	54.4	0.5000
51	EWMA	265.59	33.2	0.0005
52	Ft	269.38	12.6	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-33

Average running length under shift = 0.35

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	162.29	124.5	0.1000	0.35
2	EWMA	162.30	124.7	0.0500	0.35
3	at	164.78	124.5	0.0500	0.35
4	Ft	165.42	124.5	0.0500	0.35
5	EWMA	167.78	124.1	0.1000	0.35
6	DEWMA	168.74	123.9	0.2000	0.35
7	bt	169.76	123.6	0.0100	0.35
8	Ft	174.68	122.6	0.0100	0.35
9	at	174.72	122.6	0.0100	0.35
10	EWMA	179.67	121.5	0.2000	0.35
11	Ft	182.12	121.2	0.0050	0.35
12	Ft	182.19	122.7	0.0010	0.35
13	bt	182.34	120.6	0.0050	0.35
14	DEWMA	182.47	120.7	0.3000	0.35
15	at	183.60	122.2	0.0010	0.35
16	at	183.81	120.7	0.0050	0.35
17	bt	183.85	122.0	0.0010	0.35
18	Ft	183.87	122.4	0.0005	0.35
19	at	184.09	122.3	0.0005	0.35
20	Ft	184.38	120.1	0.1000	0.35
21	bt	184.45	122.1	0.0005	0.35
22	at	185.15	119.8	0.1000	0.35
23	bt	187.74	118.9	0.0500	0.35
24	DEWMA	188.11	117.8	0.0500	0.35
25	EWMA	196.27	115.2	0.0100	0.35
26	EWMA	201.48	112.9	0.3000	0.35
27	DEWMA	204.15	111.5	0.5000	0.35
28	at	209.25	108.6	0.2000	0.35
29	EWMA	210.86	107.7	0.0050	0.35
30	Ft	211.22	107.4	0.2000	0.35
31	EWMA	218.97	101.9	0.5000	0.35
32	at	220.66	100.8	0.3000	0.35
33	Ft	223.36	98.8	0.3000	0.35
34	bt	223.81	98.7	0.1000	0.35
35	DEWMA	232.11	92.3	0.0100	0.35
36	at	233.86	88.9	0.5000	0.35
37	Shewhart	239.99	82.2	0.1000	0.35
38	Shewhart	240.28	81.8	0.0500	0.35
39	Shewhart	240.32	81.8	0.5000	0.35
40	Shewhart	240.45	81.6	0.0100	0.35
41	Shewhart	240.52	81.6	0.0050	0.35
42	Shewhart	240.64	81.4	0.0005	0.35
43	Shewhart	240.73	81.3	0.2000	0.35
44	Shewhart	241.27	80.7	0.3000	0.35
45	Shewhart	242.32	79.4	0.0010	0.35
46	DEWMA	244.42	78.1	0.0050	0.35
47	bt	245.98	75.2	0.2000	0.35
48	EWMA	251.91	65.4	0.0010	0.35
49	bt	253.75	62.8	0.3000	0.35
50	bt	257.40	55.5	0.5000	0.35
51	EWMA	264.50	36.9	0.0005	0.35
52	Ft	269.16	14.6	0.5000	0.35
53	DEWMA	270.00	0.0	0.0005	0.35
54	DEWMA	270.00	0.0	0.0010	0.35

Table D4-33

	Chart	ARL1	SD	Lambda
1	EWMA	162.49	124.8	0.0500
2	DEWMA	163.92	124.1	0.1000
3	at	164.59	124.6	0.0500
4	Ft	165.11	124.6	0.0500
5	DEWMA	169.22	123.9	0.2000
6	EWMA	169.80	123.7	0.1000
7	bt	170.18	123.6	0.0100
8	at	172.70	123.1	0.0100
9	Ft	173.67	122.9	0.0100
10	EWMA	179.54	121.7	0.2000
11	bt	180.44	121.1	0.0050
12	Ft	182.06	121.2	0.0050
13	DEWMA	182.66	120.6	0.3000
14	Ft	182.99	122.7	0.0005
15	Ft	183.18	122.4	0.0010
16	at	183.25	120.8	0.0050
17	at	183.33	122.5	0.0005
18	bt	184.03	122.2	0.0005
19	Ft	184.21	120.2	0.1000
20	at	184.25	122.0	0.0010
21	bt	184.89	121.6	0.0010
22	at	185.45	119.7	0.1000
23	DEWMA	185.55	118.7	0.0500
24	bt	189.59	118.2	0.0500
25	EWMA	193.32	116.4	0.0100
26	EWMA	199.70	113.7	0.3000
27	DEWMA	203.91	111.6	0.5000
28	at	208.54	109.1	0.2000
29	EWMA	209.68	108.4	0.0050
30	Ft	211.32	107.5	0.2000
31	EWMA	219.80	101.4	0.5000
32	at	220.91	100.6	0.3000
33	bt	222.91	99.5	0.1000
34	Ft	223.92	98.3	0.3000
35	DEWMA	230.77	93.5	0.0100
36	at	234.63	88.3	0.5000
37	Shewhart	239.67	82.5	0.0500
38	Shewhart	240.02	82.3	0.0010
39	Shewhart	240.02	82.2	0.0100
40	Shewhart	240.15	82.1	0.0050
41	Shewhart	240.41	81.8	0.2000
42	Shewhart	240.48	81.7	0.5000
43	Shewhart	240.60	81.5	0.3000
44	Shewhart	241.31	80.6	0.0005
45	Shewhart	242.01	79.7	0.1000
46	DEWMA	244.56	77.9	0.0050
47	bt	247.63	72.8	0.2000
48	EWMA	251.65	65.9	0.0010
49	bt	253.55	63.2	0.3000
50	bt	257.31	55.8	0.5000
51	EWMA	264.78	36.0	0.0005
52	Ft	269.21	14.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-34

Average running length under shift = 0.4

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	137.24	125.6	0.1000	0.4
2	EWMA	140.27	126.1	0.0500	0.4
3	at	141.59	126.4	0.0500	0.4
4	Ft	141.68	126.5	0.0500	0.4
5	DEWMA	142.54	126.7	0.2000	0.4
6	EWMA	144.37	126.6	0.1000	0.4
7	bt	151.18	126.1	0.0100	0.4
8	at	155.84	125.9	0.0100	0.4
9	Ft	155.96	125.9	0.0100	0.4
10	EWMA	156.82	126.3	0.2000	0.4
11	DEWMA	162.66	125.4	0.3000	0.4
12	at	162.89	125.6	0.1000	0.4
13	Ft	163.12	125.6	0.1000	0.4
14	bt	165.88	124.7	0.0050	0.4
15	Ft	167.17	124.9	0.0050	0.4
16	at	168.37	124.6	0.0050	0.4
17	bt	170.24	124.2	0.0500	0.4
18	DEWMA	171.11	122.6	0.0500	0.4
19	Ft	172.14	125.4	0.0010	0.4
20	bt	173.03	125.0	0.0010	0.4
21	at	173.14	125.1	0.0010	0.4
22	Ft	173.52	125.4	0.0005	0.4
23	at	173.70	125.3	0.0005	0.4
24	bt	174.04	125.1	0.0005	0.4
25	EWMA	181.38	120.8	0.0100	0.4
26	EWMA	186.52	119.4	0.3000	0.4
27	DEWMA	188.53	118.8	0.5000	0.4
28	at	193.50	116.9	0.2000	0.4
29	Ft	197.38	115.3	0.2000	0.4
30	EWMA	200.55	113.4	0.0050	0.4
31	EWMA	206.85	110.0	0.5000	0.4
32	bt	212.92	107.0	0.1000	0.4
33	at	214.57	105.2	0.3000	0.4
34	Ft	218.40	102.7	0.3000	0.4
35	at	225.97	96.4	0.5000	0.4
36	DEWMA	228.23	95.7	0.0100	0.4
37	Shewhart	235.88	86.8	0.5000	0.4
38	Shewhart	235.92	86.9	0.2000	0.4
39	Shewhart	235.99	86.8	0.0050	0.4
40	Shewhart	236.19	86.5	0.0010	0.4
41	Shewhart	236.49	86.3	0.0100	0.4
42	Shewhart	236.74	85.9	0.1000	0.4
43	Shewhart	237.05	85.6	0.0500	0.4
44	Shewhart	237.45	85.2	0.0005	0.4
45	Shewhart	238.31	84.2	0.3000	0.4
46	DEWMA	244.32	78.2	0.0050	0.4
47	bt	244.36	77.5	0.2000	0.4
48	EWMA	247.05	72.8	0.0010	0.4
49	bt	252.68	64.8	0.3000	0.4
50	bt	257.54	55.3	0.5000	0.4
51	EWMA	262.77	42.1	0.0005	0.4
52	Ft	268.78	17.6	0.5000	0.4
53	DEWMA	270.00	0.0	0.0005	0.4
54	DEWMA	270.00	0.0	0.0010	0.4

Table D4-34

	Chart	ARL1	SD	Lambda
1	DEWMA	139.29	125.7	0.1000
2	EWMA	141.50	126.2	0.0500
3	Ft	142.66	126.6	0.0500
4	at	142.88	126.5	0.0500
5	EWMA	144.24	126.7	0.1000
6	DEWMA	148.39	126.6	0.2000
7	bt	151.34	126.1	0.0100
8	at	156.29	125.7	0.0100
9	Ft	157.01	125.7	0.0100
10	EWMA	161.81	125.7	0.2000
11	DEWMA	162.20	125.6	0.3000
12	at	163.04	125.5	0.1000
13	Ft	163.41	125.6	0.1000
14	bt	164.51	124.8	0.0050
15	Ft	168.61	124.6	0.0050
16	DEWMA	169.73	123.0	0.0500
17	at	169.81	124.4	0.0050
18	bt	172.09	123.8	0.0500
19	Ft	173.85	125.0	0.0010
20	bt	174.56	124.6	0.0010
21	at	174.56	124.8	0.0010
22	Ft	176.12	124.7	0.0005
23	at	176.92	124.5	0.0005
24	bt	177.57	124.2	0.0005
25	EWMA	181.15	120.8	0.0100
26	EWMA	185.74	119.7	0.3000
27	DEWMA	189.71	118.3	0.5000
28	at	196.53	115.5	0.2000
29	Ft	200.72	113.6	0.2000
30	EWMA	200.81	113.3	0.0050
31	EWMA	209.38	108.5	0.5000
32	at	212.54	106.6	0.3000
33	bt	212.83	107.1	0.1000
34	Ft	217.53	103.2	0.3000
35	at	228.29	94.3	0.5000
36	DEWMA	228.96	95.2	0.0100
37	Shewhart	234.73	88.1	0.0500
38	Shewhart	235.01	87.9	0.1000
39	Shewhart	235.08	87.7	0.0005
40	Shewhart	235.72	87.0	0.3000
41	Shewhart	236.25	86.5	0.0050
42	Shewhart	236.49	86.2	0.0100
43	Shewhart	236.60	86.1	0.5000
44	Shewhart	237.23	85.4	0.0010
45	Shewhart	237.33	85.3	0.2000
46	DEWMA	243.97	78.6	0.0050
47	bt	244.26	77.7	0.2000
48	EWMA	247.11	72.8	0.0010
49	bt	252.47	65.1	0.3000
50	bt	257.10	56.3	0.5000
51	EWMA	262.99	41.4	0.0005
52	Ft	269.00	16.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-35

Average running length under shift = 0.45

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	113.21	122.1	0.1000	0.45
2	EWMA	118.36	123.8	0.0500	0.45
3	at	120.29	124.5	0.0500	0.45
4	Ft	120.51	124.6	0.0500	0.45
5	EWMA	121.53	125.0	0.1000	0.45
6	DEWMA	122.16	125.1	0.2000	0.45
7	bt	130.39	125.5	0.0100	0.45
8	at	137.45	126.2	0.0100	0.45
9	EWMA	137.58	127.2	0.2000	0.45
10	Ft	138.34	126.2	0.0100	0.45
11	DEWMA	140.17	127.2	0.3000	0.45
12	at	141.44	127.3	0.1000	0.45
13	Ft	142.90	127.4	0.1000	0.45
14	bt	145.77	126.4	0.0050	0.45
15	Ft	151.89	126.8	0.0050	0.45
16	at	152.51	126.7	0.0050	0.45
17	DEWMA	153.29	125.1	0.0500	0.45
18	bt	153.66	126.9	0.0500	0.45
19	at	165.54	127.0	0.0005	0.45
20	bt	165.82	126.8	0.0005	0.45
21	Ft	165.88	127.0	0.0005	0.45
22	EWMA	165.92	124.4	0.0100	0.45
23	Ft	166.67	126.3	0.0010	0.45
24	bt	166.73	126.0	0.0010	0.45
25	EWMA	167.91	124.8	0.3000	0.45
26	at	168.02	126.0	0.0010	0.45
27	DEWMA	173.14	123.7	0.5000	0.45
28	at	178.91	122.2	0.2000	0.45
29	Ft	183.05	121.1	0.2000	0.45
30	EWMA	188.67	118.4	0.0050	0.45
31	EWMA	197.14	115.2	0.5000	0.45
32	at	201.84	113.0	0.3000	0.45
33	bt	202.39	113.4	0.1000	0.45
34	Ft	206.63	110.4	0.3000	0.45
35	at	220.17	101.2	0.5000	0.45
36	DEWMA	226.45	97.3	0.0100	0.45
37	Shewhart	230.25	92.5	0.0005	0.45
38	Shewhart	230.38	92.4	0.0500	0.45
39	Shewhart	230.44	92.4	0.0050	0.45
40	Shewhart	230.52	92.3	0.2000	0.45
41	Shewhart	231.25	91.6	0.3000	0.45
42	Shewhart	231.29	91.5	0.5000	0.45
43	Shewhart	231.68	91.2	0.1000	0.45
44	Shewhart	231.84	91.0	0.0010	0.45
45	Shewhart	232.32	90.6	0.0100	0.45
46	bt	240.63	82.3	0.2000	0.45
47	DEWMA	244.04	78.4	0.0050	0.45
48	EWMA	244.97	75.6	0.0010	0.45
49	bt	250.81	67.9	0.3000	0.45
50	bt	255.91	58.7	0.5000	0.45
51	EWMA	262.40	43.1	0.0005	0.45
52	Ft	268.65	18.6	0.5000	0.45
53	DEWMA	270.00	0.0	0.0005	0.45
54	DEWMA	270.00	0.0	0.0010	0.45

Table D4-35

	Chart	ARL1	SD	Lambda
1	DEWMA	114.54	122.4	0.1000
2	EWMA	115.72	123.1	0.0500
3	at	118.12	124.1	0.0500
4	Ft	118.63	124.3	0.0500
5	EWMA	120.71	124.7	0.1000
6	DEWMA	121.96	125.0	0.2000
7	bt	129.32	125.5	0.0100
8	at	136.29	126.1	0.0100
9	Ft	136.79	126.2	0.0100
10	EWMA	137.41	127.1	0.2000
11	DEWMA	140.30	127.1	0.3000
12	at	142.04	127.2	0.1000
13	Ft	144.12	127.3	0.1000
14	bt	146.13	126.5	0.0050
15	DEWMA	150.92	125.2	0.0500
16	Ft	151.90	126.8	0.0050
17	at	152.64	126.7	0.0050
18	bt	152.69	126.9	0.0500
19	Ft	163.29	127.1	0.0010
20	bt	163.95	126.7	0.0010
21	at	164.32	126.9	0.0010
22	EWMA	164.85	124.6	0.0100
23	Ft	167.49	126.6	0.0005
24	at	167.61	126.5	0.0005
25	EWMA	167.64	124.9	0.3000
26	bt	167.78	126.4	0.0005
27	DEWMA	173.09	123.7	0.5000
28	at	178.52	122.5	0.2000
29	Ft	183.00	121.2	0.2000
30	EWMA	189.75	118.2	0.0050
31	EWMA	196.94	115.3	0.5000
32	at	199.30	114.3	0.3000
33	bt	202.16	113.5	0.1000
34	Ft	206.48	110.6	0.3000
35	at	219.07	102.0	0.5000
36	DEWMA	226.36	97.4	0.0100
37	Shewhart	230.05	92.8	0.0010
38	Shewhart	230.18	92.6	0.5000
39	Shewhart	230.23	92.6	0.3000
40	Shewhart	231.40	91.4	0.2000
41	Shewhart	231.56	91.4	0.1000
42	Shewhart	231.77	91.0	0.0100
43	Shewhart	232.81	90.0	0.0050
44	Shewhart	233.00	89.9	0.0005
45	Shewhart	233.09	89.8	0.0500
46	bt	240.32	82.7	0.2000
47	EWMA	243.66	77.3	0.0010
48	DEWMA	243.92	78.6	0.0050
49	bt	250.47	68.6	0.3000
50	bt	256.94	56.7	0.5000
51	EWMA	261.96	44.2	0.0005
52	Ft	268.62	18.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-36

Average running length under shift = 0.5

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	92.00	114.9	0.1000	0.5
2	EWMA	93.13	116.0	0.0500	0.5
3	at	94.88	117.3	0.0500	0.5
4	Ft	95.41	117.6	0.0500	0.5
5	EWMA	98.47	118.8	0.1000	0.5
6	DEWMA	101.73	120.1	0.2000	0.5
7	bt	107.62	121.1	0.0100	0.5
8	at	113.46	122.8	0.0100	0.5
9	Ft	114.65	123.1	0.0100	0.5
10	EWMA	117.97	125.1	0.2000	0.5
11	DEWMA	118.35	125.0	0.3000	0.5
12	at	119.90	125.3	0.1000	0.5
13	Ft	122.55	125.9	0.1000	0.5
14	bt	127.23	125.4	0.0050	0.5
15	DEWMA	129.88	124.4	0.0500	0.5
16	bt	133.40	127.1	0.0500	0.5
17	Ft	135.35	126.9	0.0050	0.5
18	at	136.51	126.9	0.0050	0.5
19	EWMA	145.25	126.3	0.0100	0.5
20	EWMA	151.35	127.2	0.3000	0.5
21	Ft	153.18	128.2	0.0010	0.5
22	bt	153.21	127.9	0.0010	0.5
23	DEWMA	153.29	127.1	0.5000	0.5
24	at	154.71	128.0	0.0010	0.5
25	Ft	158.35	127.8	0.0005	0.5
26	bt	158.55	127.6	0.0005	0.5
27	at	158.79	127.7	0.0005	0.5
28	at	164.94	125.7	0.2000	0.5
29	Ft	170.26	124.8	0.2000	0.5
30	EWMA	174.97	122.8	0.0050	0.5
31	EWMA	181.24	121.6	0.5000	0.5
32	at	187.74	119.4	0.3000	0.5
33	bt	191.26	118.8	0.1000	0.5
34	Ft	197.54	115.3	0.3000	0.5
35	at	210.92	107.8	0.5000	0.5
36	DEWMA	222.92	100.2	0.0100	0.5
37	Shewhart	225.06	97.3	0.0005	0.5
38	Shewhart	225.72	96.6	0.2000	0.5
39	Shewhart	225.99	96.5	0.5000	0.5
40	Shewhart	226.03	96.4	0.3000	0.5
41	Shewhart	226.18	96.3	0.0100	0.5
42	Shewhart	227.43	95.2	0.0050	0.5
43	Shewhart	227.56	95.1	0.1000	0.5
44	Shewhart	227.93	94.6	0.0010	0.5
45	Shewhart	228.03	94.6	0.0500	0.5
46	bt	237.88	85.7	0.2000	0.5
47	EWMA	239.89	81.9	0.0010	0.5
48	DEWMA	241.07	82.3	0.0050	0.5
49	bt	250.01	69.3	0.3000	0.5
50	bt	255.96	58.7	0.5000	0.5
51	EWMA	260.81	47.2	0.0005	0.5
52	Ft	268.61	18.9	0.5000	0.5
53	DEWMA	270.00	0.0	0.0005	0.5
54	DEWMA	270.00	0.0	0.0010	0.5

Table D4-36

	Chart	ARL1	SD	Lambda
1	EWMA	91.56	115.4	0.0500
2	DEWMA	93.05	115.4	0.1000
3	at	93.55	116.8	0.0500
4	Ft	94.23	117.2	0.0500
5	EWMA	99.81	119.5	0.1000
6	DEWMA	100.34	119.7	0.2000
7	bt	110.68	121.9	0.0100
8	at	116.70	123.3	0.0100
9	Ft	117.38	123.5	0.0100
10	DEWMA	117.68	125.0	0.3000
11	EWMA	118.87	125.3	0.2000
12	at	121.09	125.6	0.1000
13	Ft	122.74	126.0	0.1000
14	bt	128.27	125.6	0.0050
15	DEWMA	128.95	124.2	0.0500
16	bt	129.47	126.9	0.0500
17	Ft	136.10	126.8	0.0050
18	at	137.29	126.8	0.0050
19	EWMA	148.76	127.3	0.3000
20	EWMA	148.94	126.1	0.0100
21	DEWMA	152.32	127.2	0.5000
22	Ft	155.32	128.1	0.0010
23	bt	155.40	127.8	0.0010
24	bt	156.28	128.0	0.0005
25	Ft	156.34	128.1	0.0005
26	at	156.57	128.1	0.0005
27	at	156.68	127.9	0.0010
28	at	164.66	125.9	0.2000
29	Ft	169.93	124.9	0.2000
30	EWMA	175.99	122.4	0.0050
31	EWMA	181.89	121.4	0.5000
32	at	188.32	119.2	0.3000
33	bt	190.33	119.2	0.1000
34	Ft	196.60	115.8	0.3000
35	at	210.55	108.0	0.5000
36	Shewhart	225.20	97.1	0.0500
37	Shewhart	225.78	96.6	0.5000
38	Shewhart	225.84	96.6	0.0010
39	Shewhart	226.00	96.5	0.0005
40	Shewhart	226.28	96.2	0.1000
41	Shewhart	226.31	96.1	0.0050
42	Shewhart	226.51	96.0	0.3000
43	DEWMA	226.85	96.8	0.0100
44	Shewhart	227.12	95.5	0.2000
45	Shewhart	227.36	95.2	0.0100
46	bt	238.40	85.1	0.2000
47	EWMA	238.85	83.1	0.0010
48	DEWMA	242.24	80.7	0.0050
49	bt	248.57	71.6	0.3000
50	bt	255.81	59.0	0.5000
51	EWMA	260.93	46.9	0.0005
52	Ft	268.36	20.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-37

Average running length under shift = 0.55

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	72.15	103.8	0.1000	0.55
2	EWMA	73.25	105.7	0.0500	0.55
3	at	74.58	107.3	0.0500	0.55
4	Ft	76.58	108.6	0.0500	0.55
5	EWMA	78.77	109.8	0.1000	0.55
6	DEWMA	79.70	110.6	0.2000	0.55
7	bt	89.68	114.5	0.0100	0.55
8	at	96.48	117.5	0.0100	0.55
9	EWMA	97.16	119.3	0.2000	0.55
10	Ft	97.26	117.8	0.0100	0.55
11	DEWMA	97.40	119.4	0.3000	0.55
12	at	101.35	120.8	0.1000	0.55
13	Ft	103.77	121.8	0.1000	0.55
14	DEWMA	110.46	120.6	0.0500	0.55
15	bt	111.10	122.2	0.0050	0.55
16	bt	114.35	124.6	0.0500	0.55
17	Ft	120.19	124.8	0.0050	0.55
18	at	120.93	124.9	0.0050	0.55
19	EWMA	127.43	125.2	0.0100	0.55
20	EWMA	131.93	127.2	0.3000	0.55
21	DEWMA	135.57	127.5	0.5000	0.55
22	bt	144.75	128.3	0.0010	0.55
23	Ft	145.51	128.5	0.0010	0.55
24	at	146.54	127.8	0.2000	0.55
25	at	146.80	128.5	0.0010	0.55
26	bt	147.40	128.6	0.0005	0.55
27	Ft	147.51	128.7	0.0005	0.55
28	at	147.70	128.7	0.0005	0.55
29	Ft	154.98	127.5	0.2000	0.55
30	EWMA	163.44	125.0	0.0050	0.55
31	EWMA	169.74	124.7	0.5000	0.55
32	at	173.72	123.9	0.3000	0.55
33	bt	178.21	123.6	0.1000	0.55
34	Ft	183.87	121.1	0.3000	0.55
35	at	203.14	112.4	0.5000	0.55
36	Shewhart	219.13	102.0	0.0500	0.55
37	Shewhart	219.82	101.5	0.0100	0.55
38	Shewhart	219.98	101.4	0.0010	0.55
39	Shewhart	220.10	101.3	0.2000	0.55
40	Shewhart	220.21	101.2	0.0005	0.55
41	Shewhart	220.22	101.3	0.5000	0.55
42	Shewhart	220.72	100.8	0.0050	0.55
43	Shewhart	221.29	100.4	0.3000	0.55
44	DEWMA	221.56	101.1	0.0100	0.55
45	Shewhart	221.99	99.8	0.1000	0.55
46	bt	233.02	91.0	0.2000	0.55
47	EWMA	234.47	87.7	0.0010	0.55
48	DEWMA	241.41	81.7	0.0050	0.55
49	bt	246.34	75.0	0.3000	0.55
50	bt	255.17	60.2	0.5000	0.55
51	EWMA	258.60	52.2	0.0005	0.55
52	Ft	268.42	20.0	0.5000	0.55
53	DEWMA	270.00	0.0	0.0005	0.55
54	DEWMA	270.00	0.0	0.0010	0.55

Table D4-37

	Chart	ARL1	SD	Lambda
1	DEWMA	73.79	105.2	0.1000
2	EWMA	74.72	106.8	0.0500
3	at	75.97	108.2	0.0500
4	Ft	77.15	109.0	0.0500
5	EWMA	78.53	109.8	0.1000
6	DEWMA	80.18	110.8	0.2000
7	bt	89.58	114.4	0.0100
8	at	96.58	117.5	0.0100
9	EWMA	97.38	119.4	0.2000
10	DEWMA	98.22	119.7	0.3000
11	Ft	98.23	118.2	0.0100
12	at	99.60	120.2	0.1000
13	Ft	101.52	121.0	0.1000
14	bt	109.12	121.7	0.0050
15	DEWMA	111.82	121.0	0.0500
16	bt	114.88	124.8	0.0500
17	Ft	118.74	124.5	0.0050
18	at	119.44	124.6	0.0050
19	EWMA	129.88	125.7	0.0100
20	EWMA	131.00	127.1	0.3000
21	DEWMA	135.08	127.5	0.5000
22	bt	142.11	128.4	0.0010
23	Ft	143.26	128.7	0.0010
24	at	144.36	128.6	0.0010
25	at	147.30	127.8	0.2000
26	bt	150.67	128.4	0.0005
27	Ft	151.11	128.6	0.0005
28	at	151.35	128.5	0.0005
29	Ft	155.01	127.4	0.2000
30	EWMA	162.51	125.1	0.0050
31	EWMA	167.30	125.2	0.5000
32	at	174.73	123.7	0.3000
33	bt	178.02	123.6	0.1000
34	Ft	184.71	120.8	0.3000
35	at	201.43	113.2	0.5000
36	Shewhart	218.63	102.4	0.2000
37	Shewhart	219.13	102.1	0.0500
38	Shewhart	219.24	102.0	0.0005
39	Shewhart	219.52	101.7	0.1000
40	Shewhart	219.67	101.7	0.0050
41	Shewhart	219.77	101.4	0.5000
42	DEWMA	220.63	102.1	0.0100
43	Shewhart	221.02	100.6	0.0100
44	Shewhart	221.24	100.4	0.0010
45	Shewhart	221.27	100.4	0.3000
46	bt	232.27	91.8	0.2000
47	EWMA	233.23	89.0	0.0010
48	DEWMA	241.28	81.9	0.0050
49	bt	246.48	74.7	0.3000
50	bt	255.42	59.8	0.5000
51	EWMA	258.86	51.7	0.0005
52	Ft	268.15	21.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-38

Average running length under shift = 0.6

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	56.31	91.8	0.1000	0.6
2	EWMA	57.96	94.5	0.0500	0.6
3	at	59.03	96.3	0.0500	0.6
4	Ft	59.56	96.9	0.0500	0.6
5	EWMA	62.31	99.2	0.1000	0.6
6	DEWMA	64.20	100.6	0.2000	0.6
7	bt	72.52	105.0	0.0100	0.6
8	DEWMA	78.82	110.9	0.3000	0.6
9	EWMA	80.58	112.0	0.2000	0.6
10	at	80.73	110.0	0.0100	0.6
11	Ft	81.37	110.3	0.0100	0.6
12	at	81.42	112.5	0.1000	0.6
13	Ft	85.79	115.0	0.1000	0.6
14	DEWMA	93.36	114.4	0.0500	0.6
15	bt	94.04	116.5	0.0050	0.6
16	bt	95.57	119.1	0.0500	0.6
17	Ft	105.20	121.1	0.0050	0.6
18	at	105.41	121.1	0.0050	0.6
19	EWMA	112.17	124.1	0.3000	0.6
20	EWMA	114.05	122.8	0.0100	0.6
21	DEWMA	116.79	125.3	0.5000	0.6
22	at	131.15	127.6	0.2000	0.6
23	bt	133.34	127.9	0.0010	0.6
24	Ft	134.96	128.3	0.0010	0.6
25	at	135.96	128.3	0.0010	0.6
26	bt	139.54	128.6	0.0005	0.6
27	Ft	139.71	128.8	0.0005	0.6
28	Ft	139.93	128.2	0.2000	0.6
29	at	140.10	128.8	0.0005	0.6
30	EWMA	150.76	126.4	0.0050	0.6
31	EWMA	154.75	127.2	0.5000	0.6
32	at	160.44	126.6	0.3000	0.6
33	bt	165.07	126.9	0.1000	0.6
34	Ft	173.13	124.2	0.3000	0.6
35	at	193.56	117.1	0.5000	0.6
36	Shewhart	211.74	107.2	0.0005	0.6
37	Shewhart	212.11	106.9	0.0500	0.6
38	Shewhart	212.92	106.4	0.0010	0.6
39	Shewhart	213.16	106.3	0.1000	0.6
40	Shewhart	213.18	106.2	0.3000	0.6
41	Shewhart	213.32	106.2	0.0100	0.6
42	Shewhart	214.05	105.8	0.2000	0.6
43	Shewhart	214.09	105.7	0.0050	0.6
44	Shewhart	214.93	105.1	0.5000	0.6
45	DEWMA	219.23	102.9	0.0100	0.6
46	bt	228.56	95.5	0.2000	0.6
47	EWMA	228.78	93.2	0.0010	0.6
48	DEWMA	240.93	82.3	0.0050	0.6
49	bt	244.81	77.2	0.3000	0.6
50	bt	254.55	61.5	0.5000	0.6
51	EWMA	256.19	57.2	0.0005	0.6
52	Ft	267.41	25.6	0.5000	0.6
53	DEWMA	270.00	0.0	0.0005	0.6
54	DEWMA	270.00	0.0	0.0010	0.6

Table D4-38

	Chart	ARL1	SD	Lambda
1	DEWMA	55.18	90.5	0.1000
2	EWMA	57.37	94.1	0.0500
3	at	57.75	95.2	0.0500
4	Ft	59.61	97.0	0.0500
5	EWMA	60.50	97.6	0.1000
6	DEWMA	61.52	98.5	0.2000
7	bt	72.71	105.2	0.0100
8	DEWMA	76.65	109.9	0.3000
9	at	79.21	109.2	0.0100
10	EWMA	79.52	111.5	0.2000
11	at	79.72	111.6	0.1000
12	Ft	80.75	110.1	0.0100
13	Ft	83.08	113.5	0.1000
14	DEWMA	92.68	114.1	0.0500
15	bt	94.98	118.9	0.0500
16	bt	95.99	117.3	0.0050
17	Ft	107.94	122.0	0.0050
18	at	108.71	122.1	0.0050
19	EWMA	112.00	124.2	0.3000
20	EWMA	113.42	122.8	0.0100
21	DEWMA	117.48	125.6	0.5000
22	at	129.78	127.5	0.2000
23	bt	131.59	127.8	0.0010
24	Ft	133.08	128.2	0.0010
25	at	134.36	128.2	0.0010
26	bt	137.73	128.6	0.0005
27	Ft	138.32	128.7	0.0005
28	Ft	138.46	128.2	0.2000
29	at	138.90	128.8	0.0005
30	EWMA	152.23	126.3	0.0050
31	EWMA	153.51	127.2	0.5000
32	at	161.42	126.6	0.3000
33	bt	162.81	127.3	0.1000
34	Ft	174.21	124.1	0.3000
35	at	191.99	117.7	0.5000
36	Shewhart	211.87	107.2	0.0100
37	Shewhart	212.92	106.5	0.0050
38	Shewhart	213.30	106.2	0.5000
39	Shewhart	213.33	106.1	0.0005
40	Shewhart	213.33	106.1	0.2000
41	Shewhart	213.65	105.9	0.1000
42	Shewhart	213.99	105.7	0.0500
43	Shewhart	214.11	105.6	0.3000
44	Shewhart	214.31	105.5	0.0010
45	DEWMA	218.21	103.6	0.0100
46	bt	226.93	97.0	0.2000
47	EWMA	228.23	93.7	0.0010
48	DEWMA	241.70	81.3	0.0050
49	bt	244.96	76.9	0.3000
50	bt	255.48	59.7	0.5000
51	EWMA	256.23	57.1	0.0005
52	Ft	267.74	24.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-39

Average running length under shift = 0.65

	Chart	ARL1	SD	Lambda	shift
1	EWMA	42.86	79.2	0.0500	0.65
2	DEWMA	42.94	77.8	0.1000	0.65
3	at	44.16	81.9	0.0500	0.65
4	Ft	46.07	84.3	0.0500	0.65
5	DEWMA	46.32	84.7	0.2000	0.65
6	EWMA	47.18	85.7	0.1000	0.65
7	bt	58.09	94.3	0.0100	0.65
8	EWMA	61.40	99.9	0.2000	0.65
9	DEWMA	62.11	100.3	0.3000	0.65
10	at	63.98	98.8	0.0100	0.65
11	at	64.96	102.5	0.1000	0.65
12	Ft	65.32	99.9	0.0100	0.65
13	Ft	67.75	104.7	0.1000	0.65
14	DEWMA	75.57	104.8	0.0500	0.65
15	bt	78.18	111.2	0.0500	0.65
16	bt	78.53	108.8	0.0050	0.65
17	Ft	90.31	115.5	0.0050	0.65
18	at	90.62	115.5	0.0050	0.65
19	EWMA	93.37	118.4	0.3000	0.65
20	DEWMA	97.60	120.2	0.5000	0.65
21	EWMA	97.91	117.8	0.0100	0.65
22	at	108.42	123.8	0.2000	0.65
23	Ft	118.47	126.3	0.2000	0.65
24	bt	122.58	126.7	0.0010	0.65
25	Ft	124.64	127.3	0.0010	0.65
26	at	125.67	127.3	0.0010	0.65
27	bt	129.98	128.0	0.0005	0.65
28	Ft	130.94	128.2	0.0005	0.65
29	at	131.28	128.3	0.0005	0.65
30	EWMA	136.15	126.3	0.0050	0.65
31	EWMA	136.46	127.8	0.5000	0.65
32	at	144.39	128.1	0.3000	0.65
33	bt	151.17	128.9	0.1000	0.65
34	Ft	158.66	127.3	0.3000	0.65
35	at	180.56	122.0	0.5000	0.65
36	Shewhart	205.44	111.0	0.5000	0.65
37	Shewhart	205.64	111.0	0.3000	0.65
38	Shewhart	205.71	111.0	0.0010	0.65
39	Shewhart	206.75	110.3	0.0100	0.65
40	Shewhart	206.87	110.2	0.2000	0.65
41	Shewhart	207.39	110.0	0.1000	0.65
42	Shewhart	207.56	109.7	0.0050	0.65
43	Shewhart	207.69	109.8	0.0005	0.65
44	Shewhart	210.17	108.2	0.0500	0.65
45	DEWMA	217.65	104.1	0.0100	0.65
46	bt	221.39	101.8	0.2000	0.65
47	EWMA	222.53	98.4	0.0010	0.65
48	DEWMA	240.17	83.1	0.0050	0.65
49	bt	242.49	80.3	0.3000	0.65
50	EWMA	253.18	62.5	0.0005	0.65
51	bt	253.94	62.7	0.5000	0.65
52	Ft	267.16	26.8	0.5000	0.65
53	DEWMA	270.00	0.0	0.0005	0.65
54	DEWMA	270.00	0.0	0.0010	0.65

Table D4-39

	Chart	ARL1	SD	Lambda
1	EWMA	42.35	78.5	0.0500
2	DEWMA	42.37	76.9	0.1000
3	at	43.61	81.2	0.0500
4	Ft	45.19	83.2	0.0500
5	DEWMA	46.38	84.8	0.2000
6	EWMA	46.76	85.1	0.1000
7	bt	57.76	94.0	0.0100
8	DEWMA	59.97	98.5	0.3000
9	EWMA	61.55	100.0	0.2000
10	at	63.56	98.5	0.0100
11	at	64.43	102.1	0.1000
12	Ft	64.69	99.5	0.0100
13	Ft	67.90	104.8	0.1000
14	DEWMA	76.75	105.5	0.0500
15	bt	77.88	110.9	0.0500
16	bt	78.59	108.9	0.0050
17	Ft	90.31	115.5	0.0050
18	at	90.87	115.6	0.0050
19	EWMA	93.12	118.2	0.3000
20	EWMA	97.02	117.4	0.0100
21	DEWMA	97.64	120.2	0.5000
22	at	109.78	124.1	0.2000
23	Ft	119.00	126.3	0.2000
24	bt	121.92	126.5	0.0010
25	Ft	123.85	127.1	0.0010
26	at	125.23	127.2	0.0010
27	bt	130.08	128.0	0.0005
28	Ft	130.18	128.2	0.0005
29	at	130.77	128.2	0.0005
30	EWMA	136.20	126.2	0.0050
31	EWMA	137.25	127.9	0.5000
32	at	145.85	128.1	0.3000
33	bt	149.59	129.1	0.1000
34	Ft	161.48	126.8	0.3000
35	at	181.06	121.9	0.5000
36	Shewhart	204.32	111.7	0.2000
37	Shewhart	204.36	111.6	0.0500
38	Shewhart	207.27	110.0	0.0050
39	Shewhart	207.42	109.9	0.0100
40	Shewhart	207.75	109.7	0.5000
41	Shewhart	208.03	109.6	0.3000
42	Shewhart	208.10	109.5	0.1000
43	Shewhart	208.75	109.1	0.0010
44	Shewhart	209.36	108.7	0.0005
45	DEWMA	217.48	104.0	0.0100
46	bt	221.36	101.8	0.2000
47	EWMA	222.65	98.3	0.0010
48	DEWMA	240.66	82.4	0.0050
49	bt	244.69	77.3	0.3000
50	EWMA	253.02	62.8	0.0005
51	bt	253.76	62.9	0.5000
52	Ft	266.97	27.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-40

Average running length under shift = 0.7

	Chart	ARL1	SD	Lambda	shift
1	EWMA	32.20	65.0	0.0500	0.7
2	at	32.36	66.7	0.0500	0.7
3	DEWMA	33.37	64.7	0.1000	0.7
4	Ft	33.41	68.5	0.0500	0.7
5	DEWMA	34.96	71.0	0.2000	0.7
6	EWMA	35.62	71.9	0.1000	0.7
7	bt	45.21	81.1	0.0100	0.7
8	DEWMA	46.89	87.0	0.3000	0.7
9	EWMA	46.95	87.2	0.2000	0.7
10	at	50.43	90.6	0.1000	0.7
11	at	51.61	88.0	0.0100	0.7
12	Ft	52.58	92.9	0.1000	0.7
13	Ft	52.81	89.2	0.0100	0.7
14	DEWMA	60.62	93.4	0.0500	0.7
15	bt	61.35	100.2	0.0500	0.7
16	bt	62.41	97.7	0.0050	0.7
17	at	76.02	107.8	0.0050	0.7
18	Ft	76.05	108.0	0.0050	0.7
19	EWMA	77.36	111.0	0.3000	0.7
20	DEWMA	81.55	113.5	0.5000	0.7
21	EWMA	81.72	110.2	0.0100	0.7
22	at	93.18	119.0	0.2000	0.7
23	Ft	104.48	123.3	0.2000	0.7
24	bt	112.84	124.6	0.0010	0.7
25	Ft	115.94	125.7	0.0010	0.7
26	at	116.61	125.7	0.0010	0.7
27	bt	118.20	126.2	0.0005	0.7
28	Ft	119.59	126.6	0.0005	0.7
29	at	119.91	126.7	0.0005	0.7
30	EWMA	121.11	126.4	0.5000	0.7
31	EWMA	121.94	124.6	0.0050	0.7
32	at	129.05	127.6	0.3000	0.7
33	bt	135.42	129.4	0.1000	0.7
34	Ft	146.11	128.4	0.3000	0.7
35	at	169.82	125.0	0.5000	0.7
36	Shewhart	197.56	115.2	0.0500	0.7
37	Shewhart	198.11	115.0	0.0005	0.7
38	Shewhart	198.12	114.9	0.1000	0.7
39	Shewhart	198.29	114.8	0.3000	0.7
40	Shewhart	198.79	114.7	0.5000	0.7
41	Shewhart	199.10	114.5	0.0010	0.7
42	Shewhart	199.34	114.3	0.0100	0.7
43	Shewhart	199.54	114.2	0.0050	0.7
44	Shewhart	200.96	113.5	0.2000	0.7
45	EWMA	215.89	103.3	0.0010	0.7
46	bt	217.08	105.2	0.2000	0.7
47	DEWMA	217.19	104.1	0.0100	0.7
48	DEWMA	238.93	84.5	0.0050	0.7
49	bt	240.50	82.9	0.3000	0.7
50	EWMA	250.43	67.0	0.0005	0.7
51	bt	253.21	64.0	0.5000	0.7
52	Ft	266.41	30.1	0.5000	0.7
53	DEWMA	270.00	0.0	0.0005	0.7
54	DEWMA	270.00	0.0	0.0010	0.7

Table D4-40

	Chart	ARL1	SD	Lambda
1	at	32.46	66.9	0.0500
2	DEWMA	32.62	63.4	0.1000
3	EWMA	32.63	65.7	0.0500
4	Ft	34.19	69.7	0.0500
5	DEWMA	35.22	71.3	0.2000
6	EWMA	35.74	72.2	0.1000
7	bt	44.58	80.7	0.0100
8	EWMA	47.88	88.0	0.2000
9	DEWMA	48.96	89.0	0.3000
10	at	49.43	89.6	0.1000
11	at	51.23	87.8	0.0100
12	Ft	52.39	89.0	0.0100
13	Ft	52.55	92.8	0.1000
14	DEWMA	62.86	95.5	0.0500
15	bt	63.97	102.2	0.0500
16	bt	65.09	99.8	0.0050
17	Ft	78.25	109.3	0.0050
18	EWMA	78.30	111.5	0.3000
19	at	78.61	109.5	0.0050
20	EWMA	81.04	110.1	0.0100
21	DEWMA	81.91	113.5	0.5000
22	at	94.32	119.4	0.2000
23	Ft	104.22	123.1	0.2000
24	bt	110.97	124.3	0.0010
25	Ft	113.69	125.3	0.0010
26	at	114.78	125.4	0.0010
27	bt	120.20	126.5	0.0005
28	at	121.29	126.8	0.0005
29	Ft	121.37	126.8	0.0005
30	EWMA	121.62	126.4	0.5000
31	EWMA	121.94	124.6	0.0050
32	at	130.79	127.9	0.3000
33	bt	137.37	129.5	0.1000
34	Ft	148.23	128.4	0.3000
35	at	168.28	125.3	0.5000
36	Shewhart	197.52	115.3	0.5000
37	Shewhart	197.60	115.1	0.0100
38	Shewhart	198.04	115.0	0.0500
39	Shewhart	198.34	114.9	0.0005
40	Shewhart	198.75	114.7	0.0050
41	Shewhart	199.03	114.6	0.3000
42	Shewhart	199.07	114.5	0.2000
43	Shewhart	199.90	114.2	0.0010
44	Shewhart	200.17	113.9	0.1000
45	DEWMA	212.50	107.4	0.0100
46	EWMA	215.91	103.4	0.0010
47	bt	216.02	106.0	0.2000
48	bt	238.62	85.2	0.3000
49	DEWMA	238.84	84.5	0.0050
50	EWMA	250.60	66.8	0.0005
51	bt	253.49	63.5	0.5000
52	Ft	267.13	27.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-41

Average running length under shift = 0.75

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	24.75	48.7	0.1000	0.75
2	EWMA	25.27	53.2	0.0500	0.75
3	at	25.46	55.5	0.0500	0.75
4	DEWMA	26.47	57.7	0.2000	0.75
5	Ft	26.68	58.0	0.0500	0.75
6	EWMA	26.96	58.6	0.1000	0.75
7	bt	35.06	68.3	0.0100	0.75
8	DEWMA	35.64	73.8	0.3000	0.75
9	EWMA	35.79	74.0	0.2000	0.75
10	at	37.98	77.0	0.1000	0.75
11	at	40.25	75.4	0.0100	0.75
12	Ft	40.38	80.3	0.1000	0.75
13	Ft	40.85	76.2	0.0100	0.75
14	bt	50.68	87.2	0.0050	0.75
15	bt	51.19	91.9	0.0500	0.75
16	DEWMA	51.96	85.5	0.0500	0.75
17	EWMA	62.09	101.1	0.3000	0.75
18	Ft	63.25	99.2	0.0050	0.75
19	at	64.00	99.7	0.0050	0.75
20	DEWMA	65.97	104.1	0.5000	0.75
21	EWMA	68.36	102.1	0.0100	0.75
22	at	78.97	112.5	0.2000	0.75
23	Ft	89.51	117.9	0.2000	0.75
24	bt	99.97	120.9	0.0010	0.75
25	Ft	102.80	122.2	0.0010	0.75
26	at	104.18	122.6	0.0010	0.75
27	EWMA	104.81	122.8	0.5000	0.75
28	EWMA	107.80	121.3	0.0050	0.75
29	bt	110.85	124.4	0.0005	0.75
30	Ft	112.59	125.1	0.0005	0.75
31	at	112.75	125.1	0.0005	0.75
32	at	115.78	125.9	0.3000	0.75
33	bt	120.12	128.1	0.1000	0.75
34	Ft	133.61	128.5	0.3000	0.75
35	at	156.08	127.3	0.5000	0.75
36	Shewhart	187.55	119.6	0.0005	0.75
37	Shewhart	188.22	119.3	0.0050	0.75
38	Shewhart	189.19	119.0	0.2000	0.75
39	Shewhart	189.85	118.7	0.0500	0.75
40	Shewhart	190.17	118.5	0.5000	0.75
41	Shewhart	190.26	118.5	0.1000	0.75
42	Shewhart	190.54	118.4	0.0100	0.75
43	Shewhart	191.58	118.0	0.3000	0.75
44	Shewhart	191.69	118.0	0.0010	0.75
45	EWMA	207.95	108.3	0.0010	0.75
46	DEWMA	209.24	109.5	0.0100	0.75
47	bt	210.97	109.5	0.2000	0.75
48	bt	236.30	87.8	0.3000	0.75
49	DEWMA	237.99	85.6	0.0050	0.75
50	EWMA	246.75	72.4	0.0005	0.75
51	bt	252.56	65.2	0.5000	0.75
52	Ft	266.22	30.9	0.5000	0.75
53	DEWMA	270.00	0.0	0.0005	0.75
54	DEWMA	270.00	0.0	0.0010	0.75

Table D4-41

	Chart	ARL1	SD	Lambda
1	EWMA	24.65	51.3	0.0500
2	at	25.37	54.9	0.0500
3	DEWMA	25.56	50.7	0.1000
4	DEWMA	26.29	57.3	0.2000
5	EWMA	26.61	57.9	0.1000
6	Ft	26.61	57.5	0.0500
7	DEWMA	35.15	73.1	0.3000
8	bt	35.43	69.0	0.0100
9	EWMA	35.59	73.9	0.2000
10	at	37.42	76.1	0.1000
11	at	40.92	76.4	0.0100
12	Ft	40.93	80.8	0.1000
13	Ft	41.97	77.7	0.0100
14	bt	49.20	89.6	0.0500
15	DEWMA	50.20	83.3	0.0500
16	bt	51.83	88.4	0.0050
17	EWMA	60.50	99.8	0.3000
18	Ft	64.39	100.1	0.0050
19	at	64.43	100.0	0.0050
20	DEWMA	65.86	104.0	0.5000
21	EWMA	67.54	101.5	0.0100
22	at	75.82	110.8	0.2000
23	Ft	86.65	116.8	0.2000
24	bt	99.04	120.6	0.0010
25	Ft	101.88	121.9	0.0010
26	at	102.86	122.1	0.0010
27	EWMA	104.18	122.6	0.5000
28	EWMA	108.37	121.5	0.0050
29	bt	112.06	124.9	0.0005
30	Ft	113.50	125.4	0.0005
31	at	113.81	125.4	0.0005
32	at	115.20	125.7	0.3000
33	bt	119.96	127.9	0.1000
34	Ft	133.08	128.4	0.3000
35	at	155.89	127.2	0.5000
36	Shewhart	189.71	118.7	0.0010
37	Shewhart	190.11	118.6	0.2000
38	Shewhart	190.13	118.5	0.0005
39	Shewhart	190.32	118.5	0.1000
40	Shewhart	190.35	118.4	0.5000
41	Shewhart	190.56	118.3	0.3000
42	Shewhart	190.95	118.2	0.0500
43	Shewhart	191.28	118.0	0.0100
44	Shewhart	192.54	117.4	0.0050
45	EWMA	207.50	108.6	0.0010
46	bt	208.10	111.4	0.2000
47	DEWMA	209.92	109.0	0.0100
48	bt	237.19	86.9	0.3000
49	DEWMA	237.22	86.3	0.0050
50	EWMA	245.99	73.6	0.0005
51	bt	252.65	65.0	0.5000
52	Ft	265.58	33.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-42

Average running length under shift = 0.8

	Chart	ARL1	SD	Lambda	shift
1	at	19.24	42.1	0.0500	0.8
2	EWMA	19.48	40.2	0.0500	0.8
3	EWMA	20.02	44.5	0.1000	0.8
4	Ft	20.51	45.6	0.0500	0.8
5	DEWMA	20.75	39.7	0.1000	0.8
6	DEWMA	20.98	46.7	0.2000	0.8
7	DEWMA	26.70	60.4	0.3000	0.8
8	bt	27.31	55.6	0.0100	0.8
9	at	28.23	63.2	0.1000	0.8
10	EWMA	28.61	63.9	0.2000	0.8
11	Ft	30.38	67.0	0.1000	0.8
12	at	32.06	63.8	0.0100	0.8
13	Ft	32.71	64.8	0.0100	0.8
14	bt	38.96	78.7	0.0500	0.8
15	DEWMA	41.33	72.9	0.0500	0.8
16	bt	42.13	77.5	0.0050	0.8
17	EWMA	47.97	89.0	0.3000	0.8
18	DEWMA	52.76	93.8	0.5000	0.8
19	Ft	54.57	91.7	0.0050	0.8
20	at	54.64	91.6	0.0050	0.8
21	EWMA	56.19	92.3	0.0100	0.8
22	at	62.28	102.0	0.2000	0.8
23	Ft	73.92	110.2	0.2000	0.8
24	bt	89.60	116.7	0.0010	0.8
25	EWMA	90.55	117.9	0.5000	0.8
26	Ft	93.43	118.6	0.0010	0.8
27	at	94.22	118.9	0.0010	0.8
28	EWMA	97.91	118.0	0.0050	0.8
29	at	98.21	121.2	0.3000	0.8
30	bt	100.28	121.4	0.0005	0.8
31	Ft	101.59	122.0	0.0005	0.8
32	at	101.68	122.0	0.0005	0.8
33	bt	104.93	124.9	0.1000	0.8
34	Ft	118.41	126.8	0.3000	0.8
35	at	144.65	128.2	0.5000	0.8
36	Shewhart	180.10	122.3	0.0100	0.8
37	Shewhart	181.44	121.8	0.5000	0.8
38	Shewhart	181.60	121.7	0.0050	0.8
39	Shewhart	182.44	121.4	0.1000	0.8
40	Shewhart	182.45	121.4	0.0005	0.8
41	Shewhart	182.63	121.3	0.2000	0.8
42	Shewhart	182.84	121.3	0.3000	0.8
43	Shewhart	183.06	121.2	0.0010	0.8
44	Shewhart	183.88	120.9	0.0500	0.8
45	EWMA	200.78	112.2	0.0010	0.8
46	bt	202.33	114.9	0.2000	0.8
47	DEWMA	207.24	110.4	0.0100	0.8
48	bt	233.02	91.4	0.3000	0.8
49	DEWMA	237.23	86.2	0.0050	0.8
50	EWMA	242.72	77.8	0.0005	0.8
51	bt	252.50	65.3	0.5000	0.8
52	Ft	265.16	34.9	0.5000	0.8
53	DEWMA	270.00	0.0	0.0005	0.8
54	DEWMA	270.00	0.0	0.0010	0.8

Table D4-42

	Chart	ARL1	SD	Lambda
1	EWMA	19.32	40.0	0.0500
2	at	19.39	42.6	0.0500
3	Ft	20.46	45.6	0.0500
4	EWMA	20.66	46.2	0.1000
5	DEWMA	20.79	39.4	0.1000
6	DEWMA	20.97	46.9	0.2000
7	DEWMA	26.74	60.5	0.3000
8	at	28.04	62.6	0.1000
9	EWMA	28.15	63.2	0.2000
10	bt	28.72	58.5	0.0100
11	Ft	31.51	68.8	0.1000
12	at	32.59	64.4	0.0100
13	Ft	33.46	65.9	0.0100
14	bt	38.47	78.2	0.0500
15	DEWMA	39.73	70.7	0.0500
16	bt	42.04	77.6	0.0050
17	EWMA	47.13	88.0	0.3000
18	DEWMA	52.72	93.9	0.5000
19	at	53.92	91.2	0.0050
20	Ft	54.04	91.4	0.0050
21	EWMA	56.70	92.6	0.0100
22	at	62.72	102.5	0.2000
23	Ft	73.70	110.2	0.2000
24	bt	90.04	116.9	0.0010
25	EWMA	90.79	118.0	0.5000
26	Ft	93.29	118.6	0.0010
27	EWMA	93.79	116.3	0.0050
28	at	94.54	119.0	0.0010
29	at	98.21	121.2	0.3000
30	bt	99.96	121.4	0.0005
31	at	101.83	122.2	0.0005
32	Ft	102.09	122.3	0.0005
33	bt	107.73	125.7	0.1000
34	Ft	117.41	126.6	0.3000
35	at	144.74	128.2	0.5000
36	Shewhart	178.87	122.5	0.3000
37	Shewhart	179.92	122.2	0.0005
38	Shewhart	180.07	122.2	0.0500
39	Shewhart	180.63	122.0	0.0100
40	Shewhart	180.72	122.0	0.0050
41	Shewhart	181.20	121.7	0.1000
42	Shewhart	181.87	121.6	0.2000
43	Shewhart	183.19	121.1	0.0010
44	Shewhart	184.14	120.9	0.5000
45	bt	200.63	115.8	0.2000
46	EWMA	202.33	111.4	0.0010
47	DEWMA	208.89	109.5	0.0100
48	bt	232.91	91.5	0.3000
49	DEWMA	236.34	87.4	0.0050
50	EWMA	240.27	80.8	0.0005
51	bt	251.09	67.7	0.5000
52	Ft	264.45	37.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-43

Average running length under shift = 0.85

	Chart	ARL1	SD	Lambda	shift
1	at	15.63	32.3	0.0500	0.85
2	DEWMA	16.02	34.2	0.2000	0.85
3	EWMA	16.13	31.0	0.0500	0.85
4	EWMA	16.14	35.0	0.1000	0.85
5	Ft	16.15	34.4	0.0500	0.85
6	DEWMA	16.81	27.9	0.1000	0.85
7	DEWMA	20.38	48.2	0.3000	0.85
8	EWMA	21.09	50.2	0.2000	0.85
9	at	21.66	51.3	0.1000	0.85
10	bt	22.72	46.5	0.0100	0.85
11	Ft	23.90	56.3	0.1000	0.85
12	at	25.91	52.8	0.0100	0.85
13	Ft	26.63	54.3	0.0100	0.85
14	bt	30.91	68.0	0.0500	0.85
15	DEWMA	32.55	59.3	0.0500	0.85
16	bt	33.61	66.0	0.0050	0.85
17	EWMA	36.49	75.9	0.3000	0.85
18	DEWMA	40.20	81.1	0.5000	0.85
19	Ft	45.23	82.3	0.0050	0.85
20	at	45.24	82.2	0.0050	0.85
21	EWMA	45.56	81.3	0.0100	0.85
22	at	49.20	91.1	0.2000	0.85
23	Ft	59.89	100.9	0.2000	0.85
24	EWMA	74.18	109.8	0.5000	0.85
25	bt	81.24	112.6	0.0010	0.85
26	EWMA	82.88	111.1	0.0050	0.85
27	at	83.99	115.4	0.3000	0.85
28	Ft	85.61	115.2	0.0010	0.85
29	at	86.76	115.6	0.0010	0.85
30	bt	93.43	118.8	0.0005	0.85
31	bt	93.76	121.5	0.1000	0.85
32	Ft	94.95	119.6	0.0005	0.85
33	at	95.25	119.7	0.0005	0.85
34	Ft	105.39	123.9	0.3000	0.85
35	at	132.28	128.1	0.5000	0.85
36	Shewhart	170.54	124.8	0.0500	0.85
37	Shewhart	170.97	124.7	0.2000	0.85
38	Shewhart	171.63	124.6	0.0100	0.85
39	Shewhart	172.12	124.4	0.1000	0.85
40	Shewhart	172.42	124.4	0.3000	0.85
41	Shewhart	173.25	124.1	0.0050	0.85
42	Shewhart	173.69	124.0	0.5000	0.85
43	Shewhart	174.43	123.9	0.0010	0.85
44	Shewhart	174.77	123.7	0.0005	0.85
45	EWMA	191.33	116.3	0.0010	0.85
46	bt	195.58	118.4	0.2000	0.85
47	DEWMA	206.00	111.1	0.0100	0.85
48	bt	232.09	92.4	0.3000	0.85
49	DEWMA	236.90	86.6	0.0050	0.85
50	EWMA	238.45	82.8	0.0005	0.85
51	bt	250.27	69.0	0.5000	0.85
52	Ft	263.86	39.2	0.5000	0.85
53	DEWMA	270.00	0.0	0.0005	0.85
54	DEWMA	270.00	0.0	0.0010	0.85

Table D4-43

	Chart	ARL1	SD	Lambda
1	EWMA	15.65	33.3	0.1000
2	at	16.18	34.8	0.0500
3	DEWMA	16.29	35.3	0.2000
4	EWMA	16.77	33.6	0.0500
5	DEWMA	16.78	27.8	0.1000
6	Ft	16.94	37.4	0.0500
7	DEWMA	20.65	49.0	0.3000
8	EWMA	21.21	50.7	0.2000
9	at	21.84	52.1	0.1000
10	bt	21.94	44.4	0.0100
11	Ft	23.84	56.5	0.1000
12	at	25.45	51.7	0.0100
13	Ft	26.17	53.2	0.0100
14	bt	29.62	66.0	0.0500
15	DEWMA	33.64	61.2	0.0500
16	bt	34.40	67.4	0.0050
17	EWMA	37.54	77.4	0.3000
18	DEWMA	43.02	84.3	0.5000
19	at	44.69	81.5	0.0050
20	Ft	44.92	82.0	0.0050
21	EWMA	45.62	81.4	0.0100
22	at	50.18	92.0	0.2000
23	Ft	61.16	101.9	0.2000
24	EWMA	78.72	112.4	0.5000
25	EWMA	83.05	111.3	0.0050
26	bt	83.30	113.6	0.0010
27	at	86.45	116.6	0.3000
28	Ft	87.22	115.9	0.0010
29	at	88.17	116.2	0.0010
30	bt	89.37	119.6	0.1000
31	bt	92.13	118.2	0.0005
32	Ft	93.90	119.1	0.0005
33	at	94.12	119.1	0.0005
34	Ft	107.11	124.4	0.3000
35	at	134.82	128.1	0.5000
36	Shewhart	171.21	124.7	0.0010
37	Shewhart	171.46	124.5	0.0500
38	Shewhart	171.97	124.5	0.0100
39	Shewhart	172.13	124.5	0.2000
40	Shewhart	172.15	124.4	0.0050
41	Shewhart	172.18	124.4	0.0005
42	Shewhart	172.19	124.4	0.1000
43	Shewhart	172.88	124.2	0.3000
44	Shewhart	173.35	124.1	0.5000
45	bt	194.25	119.0	0.2000
46	EWMA	194.89	115.0	0.0010
47	DEWMA	205.23	111.4	0.0100
48	bt	230.30	94.2	0.3000
49	DEWMA	235.80	87.9	0.0050
50	EWMA	238.03	83.3	0.0005
51	bt	250.96	67.8	0.5000
52	Ft	263.64	39.9	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-44

Average running length under shift = 0.9

	Chart	ARL1	SD	Lambda	shift
1	at	13.01	24.0	0.0500	0.9
2	EWMA	13.24	26.1	0.1000	0.9
3	DEWMA	13.34	25.5	0.2000	0.9
4	Ft	13.57	27.0	0.0500	0.9
5	EWMA	13.92	24.4	0.0500	0.9
6	DEWMA	15.07	22.3	0.1000	0.9
7	DEWMA	15.72	37.0	0.3000	0.9
8	EWMA	16.52	39.7	0.2000	0.9
9	at	17.16	41.6	0.1000	0.9
10	bt	18.54	36.2	0.0100	0.9
11	Ft	18.91	46.5	0.1000	0.9
12	at	20.71	41.2	0.0100	0.9
13	Ft	21.26	42.7	0.0100	0.9
14	bt	23.67	56.1	0.0500	0.9
15	bt	27.53	55.6	0.0050	0.9
16	DEWMA	27.63	50.1	0.0500	0.9
17	EWMA	29.75	67.0	0.3000	0.9
18	DEWMA	30.87	69.0	0.5000	0.9
19	at	37.50	72.5	0.0050	0.9
20	Ft	37.72	73.0	0.0050	0.9
21	EWMA	38.06	72.2	0.0100	0.9
22	at	39.17	80.5	0.2000	0.9
23	Ft	48.37	91.1	0.2000	0.9
24	EWMA	62.92	102.6	0.5000	0.9
25	at	71.61	109.0	0.3000	0.9
26	bt	72.43	107.5	0.0010	0.9
27	EWMA	73.67	105.8	0.0050	0.9
28	Ft	77.16	110.8	0.0010	0.9
29	at	77.94	111.1	0.0010	0.9
30	bt	80.30	115.7	0.1000	0.9
31	bt	82.29	113.4	0.0005	0.9
32	at	84.46	114.6	0.0005	0.9
33	Ft	84.64	114.7	0.0005	0.9
34	Ft	92.67	120.0	0.3000	0.9
35	at	117.85	126.3	0.5000	0.9
36	Shewhart	160.33	126.7	0.0100	0.9
37	Shewhart	160.43	126.7	0.0500	0.9
38	Shewhart	161.14	126.6	0.5000	0.9
39	Shewhart	161.83	126.5	0.0005	0.9
40	Shewhart	161.90	126.6	0.3000	0.9
41	Shewhart	162.32	126.5	0.0050	0.9
42	Shewhart	162.52	126.5	0.1000	0.9
43	Shewhart	163.14	126.4	0.0010	0.9
44	Shewhart	163.99	126.3	0.2000	0.9
45	EWMA	183.17	119.3	0.0010	0.9
46	bt	187.33	122.1	0.2000	0.9
47	DEWMA	200.66	113.9	0.0100	0.9
48	bt	223.72	100.4	0.3000	0.9
49	DEWMA	235.11	88.5	0.0050	0.9
50	EWMA	235.24	86.2	0.0005	0.9
51	bt	249.10	71.0	0.5000	0.9
52	Ft	263.80	39.5	0.5000	0.9
53	DEWMA	270.00	0.0	0.0005	0.9
54	DEWMA	270.00	0.0	0.0010	0.9

Table D4-44

	Chart	ARL1	SD	Lambda
1	at	13.00	24.3	0.0500
2	EWMA	13.42	21.8	0.0500
3	EWMA	13.47	26.9	0.1000
4	Ft	13.58	27.2	0.0500
5	DEWMA	13.78	28.1	0.2000
6	DEWMA	15.11	22.2	0.1000
7	DEWMA	16.49	39.4	0.3000
8	EWMA	16.83	41.1	0.2000
9	at	17.31	41.9	0.1000
10	bt	18.10	34.6	0.0100
11	Ft	18.57	45.5	0.1000
12	at	21.13	42.4	0.0100
13	Ft	21.63	43.7	0.0100
14	bt	23.37	55.6	0.0500
15	DEWMA	26.94	48.5	0.0500
16	bt	27.65	56.1	0.0050
17	EWMA	29.26	66.0	0.3000
18	DEWMA	31.55	70.0	0.5000
19	Ft	37.35	72.5	0.0050
20	at	37.40	72.4	0.0050
21	EWMA	37.70	71.6	0.0100
22	at	39.34	81.0	0.2000
23	Ft	49.04	91.9	0.2000
24	EWMA	62.22	101.9	0.5000
25	at	70.45	108.1	0.3000
26	EWMA	72.32	104.8	0.0050
27	bt	72.90	107.7	0.0010
28	Ft	76.88	110.4	0.0010
29	at	78.25	111.2	0.0010
30	bt	80.00	115.6	0.1000
31	bt	84.95	114.9	0.0005
32	Ft	86.80	116.0	0.0005
33	at	87.00	116.0	0.0005
34	Ft	92.50	119.9	0.3000
35	at	117.47	126.1	0.5000
36	Shewhart	160.86	126.7	0.2000
37	Shewhart	161.21	126.7	0.3000
38	Shewhart	161.67	126.5	0.0100
39	Shewhart	161.97	126.5	0.0050
40	Shewhart	162.21	126.4	0.1000
41	Shewhart	162.39	126.4	0.0005
42	Shewhart	162.81	126.5	0.5000
43	Shewhart	163.03	126.4	0.0500
44	Shewhart	163.85	126.3	0.0010
45	EWMA	183.76	119.0	0.0010
46	bt	187.04	122.2	0.2000
47	DEWMA	202.16	113.2	0.0100
48	bt	226.14	98.2	0.3000
49	EWMA	234.09	87.4	0.0005
50	DEWMA	235.81	87.8	0.0050
51	bt	249.58	70.2	0.5000
52	Ft	263.47	40.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-45

Average running length under shift = 1

	Chart	ARL1	SD	Lambda	shift
1	EWMA	10.02	13.1	0.1000	1
2	DEWMA	10.11	12.2	0.2000	1
3	at	10.43	14.5	0.0500	1
4	Ft	10.70	16.7	0.0500	1
5	EWMA	10.74	22.0	0.2000	1
6	DEWMA	10.85	21.9	0.3000	1
7	EWMA	11.09	12.6	0.0500	1
8	at	11.12	22.8	0.1000	1
9	Ft	11.90	26.7	0.1000	1
10	DEWMA	12.60	11.9	0.1000	1
11	bt	13.87	21.3	0.0100	1
12	bt	15.34	37.5	0.0500	1
13	at	15.45	26.5	0.0100	1
14	Ft	15.92	28.5	0.0100	1
15	EWMA	17.19	43.5	0.3000	1
16	DEWMA	17.99	45.7	0.5000	1
17	bt	19.03	37.1	0.0050	1
18	DEWMA	20.81	33.2	0.0500	1
19	at	22.44	56.0	0.2000	1
20	Ft	24.95	52.0	0.0050	1
21	at	24.96	51.9	0.0050	1
22	EWMA	26.05	52.9	0.0100	1
23	Ft	30.23	70.0	0.2000	1
24	EWMA	40.03	81.4	0.5000	1
25	at	46.00	88.6	0.3000	1
26	EWMA	53.36	89.8	0.0050	1
27	bt	55.82	99.9	0.1000	1
28	bt	55.97	95.1	0.0010	1
29	Ft	59.94	98.8	0.0010	1
30	at	60.76	99.4	0.0010	1
31	Ft	66.21	106.2	0.3000	1
32	bt	70.64	106.8	0.0005	1
33	at	72.62	108.2	0.0005	1
34	Ft	72.89	108.4	0.0005	1
35	at	92.74	119.2	0.5000	1
36	Shewhart	140.63	128.2	0.0010	1
37	Shewhart	140.94	128.3	0.0005	1
38	Shewhart	141.01	128.2	0.5000	1
39	Shewhart	141.22	128.3	0.2000	1
40	Shewhart	141.73	128.2	0.0500	1
41	Shewhart	141.97	128.3	0.1000	1
42	Shewhart	143.40	128.3	0.0100	1
43	Shewhart	143.45	128.2	0.3000	1
44	Shewhart	143.60	128.2	0.0050	1
45	EWMA	164.06	123.8	0.0010	1
46	bt	166.68	128.6	0.2000	1
47	DEWMA	195.18	116.4	0.0100	1
48	bt	217.47	105.5	0.3000	1
49	EWMA	221.46	98.5	0.0005	1
50	DEWMA	232.23	91.3	0.0050	1
51	bt	247.33	73.8	0.5000	1
52	Ft	259.60	50.6	0.5000	1
53	DEWMA	270.00	0.0	0.0005	1
54	DEWMA	270.00	0.0	0.0010	1

Table D4-45

	Chart	ARL1	SD	Lambda
1	at	10.07	11.7	0.0500
2	EWMA	10.10	13.4	0.1000
3	DEWMA	10.13	12.5	0.2000
4	Ft	10.28	13.9	0.0500
5	DEWMA	10.70	20.4	0.3000
6	EWMA	10.87	11.2	0.0500
7	EWMA	10.99	23.7	0.2000
8	at	11.42	24.5	0.1000
9	DEWMA	12.48	10.1	0.1000
10	Ft	12.50	29.4	0.1000
11	bt	14.00	20.8	0.0100
12	bt	14.91	36.2	0.0500
13	at	15.54	26.0	0.0100
14	Ft	15.64	26.2	0.0100
15	EWMA	17.25	43.5	0.3000
16	DEWMA	19.16	48.7	0.5000
17	bt	19.22	37.4	0.0050
18	DEWMA	20.26	31.2	0.0500
19	at	23.85	58.9	0.2000
20	EWMA	25.19	50.4	0.0100
21	at	25.60	53.2	0.0050
22	Ft	25.71	53.7	0.0050
23	Ft	31.35	71.8	0.2000
24	EWMA	40.30	81.8	0.5000
25	at	46.04	88.7	0.3000
26	EWMA	53.69	90.1	0.0050
27	bt	56.64	100.7	0.1000
28	bt	56.89	95.8	0.0010
29	Ft	61.39	99.9	0.0010
30	at	62.16	100.5	0.0010
31	bt	66.62	103.9	0.0005
32	Ft	67.08	106.9	0.3000
33	at	69.14	105.8	0.0005
34	Ft	69.25	106.0	0.0005
35	at	92.94	119.4	0.5000
36	Shewhart	138.12	128.1	0.2000
37	Shewhart	139.63	128.2	0.0050
38	Shewhart	139.68	128.3	0.0010
39	Shewhart	140.34	128.3	0.1000
40	Shewhart	142.00	128.3	0.0005
41	Shewhart	142.25	128.3	0.0500
42	Shewhart	142.34	128.3	0.0100
43	Shewhart	142.84	128.2	0.5000
44	Shewhart	144.20	128.3	0.3000
45	EWMA	166.01	123.5	0.0010
46	bt	168.08	128.3	0.2000
47	DEWMA	195.67	116.2	0.0100
48	bt	217.07	105.7	0.3000
49	EWMA	222.51	97.6	0.0005
50	DEWMA	231.68	91.9	0.0050
51	bt	247.66	73.2	0.5000
52	Ft	260.92	47.4	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-46

Average running length under shift

	Chart	ARL1	SD	Lambda	shift
1	EWMA	9.23	10.1	0.1000	1.05
2	at	9.29	9.7	0.0500	1.05
3	Ft	9.50	11.9	0.0500	1.05
4	DEWMA	9.51	16.3	0.3000	1.05
5	DEWMA	9.62	11.8	0.2000	1.05
6	at	9.63	17.0	0.1000	1.05
7	EWMA	9.64	18.6	0.2000	1.05
8	EWMA	10.08	9.5	0.0500	1.05
9	Ft	10.09	20.1	0.1000	1.05
10	DEWMA	11.90	7.7	0.1000	1.05
11	bt	12.44	14.1	0.0100	1.05
12	bt	12.60	29.9	0.0500	1.05
13	EWMA	13.71	34.2	0.3000	1.05
14	at	13.75	19.3	0.0100	1.05
15	Ft	13.80	19.4	0.0100	1.05
16	DEWMA	15.10	39.6	0.5000	1.05
17	bt	16.89	31.0	0.0050	1.05
18	DEWMA	18.02	23.8	0.0500	1.05
19	at	18.68	48.8	0.2000	1.05
20	EWMA	21.45	42.2	0.0100	1.05
21	at	21.81	45.4	0.0050	1.05
22	Ft	21.94	45.9	0.0050	1.05
23	Ft	25.60	63.3	0.2000	1.05
24	EWMA	32.11	71.8	0.5000	1.05
25	at	35.73	77.0	0.3000	1.05
26	EWMA	45.62	81.9	0.0050	1.05
27	bt	46.21	91.7	0.1000	1.05
28	bt	49.75	89.1	0.0010	1.05
29	Ft	54.45	94.1	0.0010	1.05
30	Ft	54.73	97.7	0.3000	1.05
31	at	54.97	94.4	0.0010	1.05
32	bt	59.46	98.5	0.0005	1.05
33	Ft	61.74	100.5	0.0005	1.05
34	at	61.75	100.5	0.0005	1.05
35	at	80.41	113.9	0.5000	1.05
36	Shewhart	128.06	127.6	0.0005	1.05
37	Shewhart	128.51	127.7	0.3000	1.05
38	Shewhart	129.18	127.8	0.0100	1.05
39	Shewhart	129.84	127.8	0.0500	1.05
40	Shewhart	130.62	128.0	0.2000	1.05
41	Shewhart	130.76	127.9	0.5000	1.05
42	Shewhart	130.86	128.0	0.0050	1.05
43	Shewhart	131.36	127.9	0.1000	1.05
44	Shewhart	132.64	128.1	0.0010	1.05
45	EWMA	155.77	124.7	0.0010	1.05
46	bt	157.97	130.3	0.2000	1.05
47	DEWMA	192.88	117.2	0.0100	1.05
48	bt	212.29	109.2	0.3000	1.05
49	EWMA	213.53	104.2	0.0005	1.05
50	DEWMA	230.75	92.9	0.0050	1.05
51	bt	244.57	77.7	0.5000	1.05
52	Ft	257.85	54.4	0.5000	1.05
53	DEWMA	270.00	0.0	0.0005	1.05
54	DEWMA	270.00	0.0	0.0010	1.05

Table D4-46

	Chart	ARL1	SD	Lambda
1	EWMA	9.23	10.7	0.1000
2	at	9.31	8.6	0.0500
3	DEWMA	9.32	7.6	0.2000
4	Ft	9.38	9.0	0.0500
5	EWMA	9.43	16.6	0.2000
6	DEWMA	9.65	17.5	0.3000
7	at	9.67	17.8	0.1000
8	Ft	10.12	20.6	0.1000
9	EWMA	10.13	8.3	0.0500
10	DEWMA	11.87	8.9	0.1000
11	bt	12.50	15.0	0.0100
12	bt	12.74	30.1	0.0500
13	EWMA	14.00	35.4	0.3000
14	at	14.04	21.7	0.0100
15	Ft	14.18	22.3	0.0100
16	DEWMA	14.70	38.1	0.5000
17	bt	16.41	29.1	0.0050
18	at	18.31	47.8	0.2000
19	DEWMA	18.72	26.8	0.0500
20	EWMA	21.18	41.7	0.0100
21	at	21.39	44.3	0.0050
22	Ft	21.40	44.6	0.0050
23	Ft	24.19	60.5	0.2000
24	EWMA	32.95	73.0	0.5000
25	at	36.92	78.7	0.3000
26	EWMA	46.42	82.8	0.0050
27	bt	46.58	92.0	0.1000
28	bt	50.50	89.9	0.0010
29	Ft	54.54	97.5	0.3000
30	Ft	54.79	94.3	0.0010
31	at	54.88	94.2	0.0010
32	bt	62.04	100.6	0.0005
33	at	64.62	102.7	0.0005
34	Ft	64.88	103.0	0.0005
35	at	79.36	113.4	0.5000
36	Shewhart	128.64	127.8	0.1000
37	Shewhart	129.59	127.7	0.3000
38	Shewhart	129.76	127.7	0.0100
39	Shewhart	130.20	128.0	0.2000
40	Shewhart	130.53	127.9	0.0005
41	Shewhart	130.64	127.9	0.0010
42	Shewhart	131.45	128.1	0.5000
43	Shewhart	131.49	128.0	0.0050
44	Shewhart	131.88	128.1	0.0500
45	EWMA	155.86	124.7	0.0010
46	bt	159.39	130.0	0.2000
47	DEWMA	191.30	118.0	0.0100
48	bt	212.20	109.3	0.3000
49	EWMA	215.81	102.6	0.0005
50	DEWMA	229.29	94.1	0.0050
51	bt	245.98	75.8	0.5000
52	Ft	258.65	52.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-47

Average running length under shift = 1.1

	Chart	ARL1	SD	Lambda	shift
1	EWMA	8.51	8.5	0.1000	1.1
2	DEWMA	8.57	13.0	0.3000	1.1
3	EWMA	8.65	15.0	0.2000	1.1
4	at	8.69	6.6	0.0500	1.1
5	at	8.71	14.5	0.1000	1.1
6	Ft	8.76	7.6	0.0500	1.1
7	DEWMA	8.95	9.4	0.2000	1.1
8	Ft	9.00	16.7	0.1000	1.1
9	EWMA	9.47	5.7	0.0500	1.1
10	bt	10.79	23.6	0.0500	1.1
11	DEWMA	11.28	6.6	0.1000	1.1
12	EWMA	11.34	27.3	0.3000	1.1
13	bt	11.60	11.7	0.0100	1.1
14	DEWMA	12.26	31.4	0.5000	1.1
15	at	12.47	14.2	0.0100	1.1
16	Ft	12.74	16.1	0.0100	1.1
17	at	13.99	37.1	0.2000	1.1
18	bt	15.12	25.5	0.0050	1.1
19	DEWMA	16.86	18.5	0.0500	1.1
20	EWMA	18.57	35.0	0.0100	1.1
21	Ft	19.13	39.1	0.0050	1.1
22	at	19.16	39.1	0.0050	1.1
23	Ft	19.31	51.6	0.2000	1.1
24	EWMA	26.53	63.2	0.5000	1.1
25	at	30.75	70.9	0.3000	1.1
26	bt	37.06	81.8	0.1000	1.1
27	EWMA	39.16	73.9	0.0050	1.1
28	bt	44.18	83.0	0.0010	1.1
29	Ft	47.40	91.3	0.3000	1.1
30	Ft	49.12	88.8	0.0010	1.1
31	at	49.23	88.7	0.0010	1.1
32	bt	52.99	92.6	0.0005	1.1
33	Ft	55.52	95.2	0.0005	1.1
34	at	55.53	95.1	0.0005	1.1
35	at	72.44	109.6	0.5000	1.1
36	Shewhart	116.65	126.1	0.2000	1.1
37	Shewhart	118.18	126.3	0.0010	1.1
38	Shewhart	119.18	126.5	0.1000	1.1
39	Shewhart	119.42	126.5	0.0500	1.1
40	Shewhart	120.15	126.8	0.0100	1.1
41	Shewhart	120.29	126.7	0.0050	1.1
42	Shewhart	120.29	126.7	0.3000	1.1
43	Shewhart	120.44	126.8	0.0005	1.1
44	Shewhart	121.58	126.9	0.5000	1.1
45	EWMA	148.52	125.2	0.0010	1.1
46	bt	150.04	131.3	0.2000	1.1
47	DEWMA	188.63	118.8	0.0100	1.1
48	bt	207.47	112.4	0.3000	1.1
49	EWMA	208.02	107.4	0.0005	1.1
50	DEWMA	229.89	93.6	0.0050	1.1
51	bt	243.77	78.8	0.5000	1.1
52	Ft	256.31	57.6	0.5000	1.1
53	DEWMA	270.00	0.0	0.0005	1.1
54	DEWMA	270.00	0.0	0.0010	1.1

Table D4-47

	Chart	ARL1	SD	Lambda
1	DEWMA	8.39	11.0	0.3000
2	EWMA	8.43	13.1	0.2000
3	at	8.56	12.5	0.1000
4	EWMA	8.58	8.0	0.1000
5	at	8.61	6.6	0.0500
6	Ft	8.70	8.0	0.0500
7	DEWMA	8.83	7.8	0.2000
8	Ft	9.10	16.9	0.1000
9	EWMA	9.37	5.1	0.0500
10	bt	10.86	24.0	0.0500
11	DEWMA	11.39	6.6	0.1000
12	EWMA	11.62	28.6	0.3000
13	bt	11.78	14.0	0.0100
14	DEWMA	12.12	30.9	0.5000
15	at	12.70	16.3	0.0100
16	Ft	12.76	16.5	0.0100
17	at	14.39	38.3	0.2000
18	bt	14.74	23.5	0.0050
19	DEWMA	16.85	19.2	0.0500
20	EWMA	18.15	33.4	0.0100
21	Ft	18.27	36.3	0.0050
22	at	18.44	36.6	0.0050
23	Ft	18.91	50.6	0.2000
24	EWMA	25.54	61.6	0.5000
25	at	29.78	69.3	0.3000
26	bt	37.17	81.9	0.1000
27	EWMA	38.45	72.7	0.0050
28	bt	43.60	82.5	0.0010
29	Ft	45.24	89.1	0.3000
30	Ft	48.03	87.8	0.0010
31	at	48.65	88.3	0.0010
32	bt	55.36	94.9	0.0005
33	at	57.89	97.3	0.0005
34	Ft	58.07	97.5	0.0005
35	at	68.51	107.0	0.5000
36	Shewhart	117.97	126.4	0.3000
37	Shewhart	118.01	126.4	0.0500
38	Shewhart	118.64	126.6	0.0050
39	Shewhart	119.26	126.5	0.1000
40	Shewhart	119.55	126.6	0.2000
41	Shewhart	120.64	126.9	0.0100
42	Shewhart	120.64	127.0	0.0005
43	Shewhart	121.37	126.9	0.5000
44	Shewhart	121.77	127.1	0.0010
45	EWMA	146.79	125.3	0.0010
46	bt	149.69	131.4	0.2000
47	DEWMA	188.63	118.8	0.0100
48	bt	206.39	113.1	0.3000
49	EWMA	210.31	106.1	0.0005
50	DEWMA	230.15	93.3	0.0050
51	bt	243.75	78.9	0.5000
52	Ft	256.33	57.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-48

Average running length under shift = 1.15

	Chart	ARL1	SD	Lambda	shift
1	EWMA	7.60	8.9	0.2000	1.15
2	DEWMA	7.73	7.0	0.3000	1.15
3	at	7.76	8.5	0.1000	1.15
4	Ft	7.92	10.7	0.1000	1.15
5	EWMA	7.93	4.7	0.1000	1.15
6	at	8.12	4.6	0.0500	1.15
7	Ft	8.14	4.7	0.0500	1.15
8	DEWMA	8.33	6.3	0.2000	1.15
9	EWMA	8.91	4.1	0.0500	1.15
10	bt	9.35	17.5	0.0500	1.15
11	DEWMA	9.80	22.3	0.5000	1.15
12	EWMA	9.84	22.7	0.3000	1.15
13	DEWMA	10.84	4.0	0.1000	1.15
14	bt	10.89	9.0	0.0100	1.15
15	at	11.82	12.9	0.0100	1.15
16	Ft	11.89	13.1	0.0100	1.15
17	at	12.18	32.8	0.2000	1.15
18	bt	13.29	17.3	0.0050	1.15
19	Ft	15.10	42.0	0.2000	1.15
20	DEWMA	15.76	14.2	0.0500	1.15
21	Ft	16.11	29.6	0.0050	1.15
22	at	16.26	30.1	0.0050	1.15
23	EWMA	16.43	28.6	0.0100	1.15
24	EWMA	19.76	51.0	0.5000	1.15
25	at	23.75	59.7	0.3000	1.15
26	bt	31.26	74.6	0.1000	1.15
27	EWMA	33.09	65.0	0.0050	1.15
28	bt	38.55	76.4	0.0010	1.15
29	Ft	39.13	82.9	0.3000	1.15
30	Ft	42.55	81.7	0.0010	1.15
31	at	43.16	82.3	0.0010	1.15
32	bt	49.03	88.9	0.0005	1.15
33	at	51.48	91.5	0.0005	1.15
34	Ft	51.72	91.8	0.0005	1.15
35	at	57.87	99.6	0.5000	1.15
36	Shewhart	107.75	124.2	0.0005	1.15
37	Shewhart	107.82	124.1	0.1000	1.15
38	Shewhart	108.57	124.4	0.3000	1.15
39	Shewhart	108.71	124.5	0.0050	1.15
40	Shewhart	108.76	124.5	0.0100	1.15
41	Shewhart	108.80	124.4	0.2000	1.15
42	Shewhart	109.31	124.7	0.0500	1.15
43	Shewhart	109.82	124.7	0.5000	1.15
44	Shewhart	111.40	125.2	0.0010	1.15
45	EWMA	138.44	125.1	0.0010	1.15
46	bt	139.89	131.9	0.2000	1.15
47	DEWMA	184.42	120.4	0.0100	1.15
48	bt	201.95	115.7	0.3000	1.15
49	EWMA	202.92	110.2	0.0005	1.15
50	DEWMA	229.94	93.4	0.0050	1.15
51	bt	241.81	81.5	0.5000	1.15
52	Ft	254.26	61.6	0.5000	1.15
53	DEWMA	270.00	0.0	0.0005	1.15
54	DEWMA	270.00	0.0	0.0010	1.15

Table D4-48

	Chart	ARL1	SD	Lambda
1	EWMA	7.59	9.3	0.2000
2	DEWMA	7.74	9.1	0.3000
3	at	7.83	9.2	0.1000
4	EWMA	7.98	4.7	0.1000
5	Ft	8.10	12.2	0.1000
6	at	8.16	6.5	0.0500
7	Ft	8.20	7.0	0.0500
8	DEWMA	8.35	6.3	0.2000
9	EWMA	8.93	5.5	0.0500
10	bt	9.00	15.0	0.0500
11	EWMA	9.37	19.9	0.3000
12	DEWMA	9.42	20.2	0.5000
13	DEWMA	10.90	4.8	0.1000
14	bt	10.92	9.0	0.0100
15	at	11.69	11.5	0.0100
16	at	11.79	30.9	0.2000
17	Ft	11.82	12.3	0.0100
18	bt	13.68	20.4	0.0050
19	Ft	15.87	44.1	0.2000
20	DEWMA	15.88	15.3	0.0500
21	EWMA	16.40	28.7	0.0100
22	at	16.66	32.1	0.0050
23	Ft	16.66	32.3	0.0050
24	EWMA	19.19	49.7	0.5000
25	at	23.76	60.1	0.3000
26	bt	30.42	73.3	0.1000
27	EWMA	33.32	65.7	0.0050
28	Ft	37.82	81.4	0.3000
29	bt	38.64	76.6	0.0010
30	Ft	42.86	82.2	0.0010
31	at	43.26	82.6	0.0010
32	bt	48.62	88.6	0.0005
33	at	51.28	91.5	0.0005
34	Ft	51.36	91.6	0.0005
35	at	57.93	99.5	0.5000
36	Shewhart	106.02	123.7	0.0005
37	Shewhart	107.49	124.2	0.3000
38	Shewhart	108.31	124.2	0.1000
39	Shewhart	108.74	124.3	0.0100
40	Shewhart	108.87	124.5	0.0010
41	Shewhart	109.11	124.5	0.2000
42	Shewhart	109.33	124.5	0.5000
43	Shewhart	109.35	124.5	0.0500
44	Shewhart	109.69	124.6	0.0050
45	EWMA	137.05	125.0	0.0010
46	bt	141.10	131.9	0.2000
47	DEWMA	183.66	120.7	0.0100
48	EWMA	200.41	111.5	0.0005
49	bt	200.91	116.2	0.3000
50	DEWMA	228.86	94.5	0.0050
51	bt	241.94	81.3	0.5000
52	Ft	254.78	60.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-49

Average running length under shift = 1.2

	Chart	ARL1	SD	Lambda	shift
1	EWMA	6.97	6.5	0.2000	1.2
2	at	7.21	6.4	0.1000	1.2
3	DEWMA	7.23	5.8	0.3000	1.2
4	Ft	7.33	7.9	0.1000	1.2
5	EWMA	7.51	3.6	0.1000	1.2
6	at	7.73	4.5	0.0500	1.2
7	Ft	7.77	5.2	0.0500	1.2
8	DEWMA	7.89	4.9	0.2000	1.2
9	bt	8.14	10.0	0.0500	1.2
10	EWMA	8.26	15.1	0.3000	1.2
11	DEWMA	8.48	17.5	0.5000	1.2
12	EWMA	8.59	6.0	0.0500	1.2
13	at	9.67	24.1	0.2000	1.2
14	bt	10.45	6.7	0.0100	1.2
15	DEWMA	10.46	3.8	0.1000	1.2
16	at	11.17	9.4	0.0100	1.2
17	Ft	11.27	10.2	0.0100	1.2
18	Ft	12.55	35.7	0.2000	1.2
19	bt	12.71	16.6	0.0050	1.2
20	EWMA	14.86	22.9	0.0100	1.2
21	at	14.93	26.3	0.0050	1.2
22	Ft	15.00	26.9	0.0050	1.2
23	DEWMA	15.15	11.6	0.0500	1.2
24	EWMA	16.42	44.0	0.5000	1.2
25	at	18.30	49.2	0.3000	1.2
26	bt	24.82	64.9	0.1000	1.2
27	EWMA	29.15	58.7	0.0050	1.2
28	Ft	31.30	73.1	0.3000	1.2
29	bt	33.59	69.6	0.0010	1.2
30	Ft	37.52	75.6	0.0010	1.2
31	at	37.88	75.9	0.0010	1.2
32	bt	43.05	82.6	0.0005	1.2
33	Ft	45.16	85.2	0.0005	1.2
34	at	45.20	85.2	0.0005	1.2
35	at	48.53	91.3	0.5000	1.2
36	Shewhart	95.20	120.2	0.2000	1.2
37	Shewhart	96.59	120.9	0.0010	1.2
38	Shewhart	97.43	121.0	0.0005	1.2
39	Shewhart	97.44	121.2	0.0050	1.2
40	Shewhart	97.95	121.2	0.0100	1.2
41	Shewhart	98.54	121.6	0.3000	1.2
42	Shewhart	98.59	121.5	0.1000	1.2
43	Shewhart	99.00	121.6	0.5000	1.2
44	Shewhart	100.61	122.2	0.0500	1.2
45	EWMA	126.98	124.1	0.0010	1.2
46	bt	129.95	131.8	0.2000	1.2
47	DEWMA	182.45	121.1	0.0100	1.2
48	EWMA	192.90	114.8	0.0005	1.2
49	bt	196.50	118.6	0.3000	1.2
50	DEWMA	226.94	96.1	0.0050	1.2
51	bt	240.44	83.2	0.5000	1.2
52	Ft	252.62	64.5	0.5000	1.2
53	DEWMA	270.00	0.0	0.0005	1.2
54	DEWMA	270.00	0.0	0.0010	1.2

Table D4-49

	Chart	ARL1	SD	Lambda
1	EWMA	7.09	8.0	0.2000
2	DEWMA	7.20	5.2	0.3000
3	at	7.20	7.0	0.1000
4	Ft	7.26	7.5	0.1000
5	EWMA	7.47	3.6	0.1000
6	at	7.68	3.6	0.0500
7	Ft	7.73	4.5	0.0500
8	DEWMA	7.87	3.3	0.2000
9	bt	8.29	12.1	0.0500
10	EWMA	8.50	4.7	0.0500
11	DEWMA	8.50	17.5	0.5000
12	EWMA	8.59	17.8	0.3000
13	at	9.59	23.2	0.2000
14	bt	10.29	7.6	0.0100
15	DEWMA	10.48	3.8	0.1000
16	at	11.01	9.4	0.0100
17	Ft	11.12	10.5	0.0100
18	Ft	12.27	34.4	0.2000
19	bt	12.34	13.7	0.0050
20	at	14.35	23.5	0.0050
21	Ft	14.40	24.1	0.0050
22	EWMA	14.49	21.6	0.0100
23	DEWMA	15.05	11.1	0.0500
24	EWMA	16.33	43.7	0.5000
25	at	18.40	49.6	0.3000
26	bt	23.84	63.3	0.1000
27	EWMA	28.84	58.2	0.0050
28	Ft	31.14	72.9	0.3000
29	bt	33.14	68.9	0.0010
30	Ft	37.01	74.9	0.0010
31	at	37.15	74.9	0.0010
32	bt	42.89	82.2	0.0005
33	at	45.38	85.2	0.0005
34	Ft	45.49	85.4	0.0005
35	at	49.98	93.0	0.5000
36	Shewhart	96.85	121.0	0.2000
37	Shewhart	97.07	120.9	0.0005
38	Shewhart	97.23	121.1	0.0100
39	Shewhart	97.77	121.2	0.1000
40	Shewhart	98.31	121.3	0.0010
41	Shewhart	99.14	121.7	0.0050
42	Shewhart	99.82	122.0	0.3000
43	Shewhart	99.98	122.0	0.0500
44	Shewhart	100.93	122.4	0.5000
45	EWMA	125.95	123.9	0.0010
46	bt	129.08	131.7	0.2000
47	DEWMA	180.24	121.7	0.0100
48	EWMA	194.33	114.3	0.0005
49	bt	196.45	118.7	0.3000
50	DEWMA	227.52	95.5	0.0050
51	bt	239.12	84.9	0.5000
52	Ft	251.52	66.5	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-50

Average running length under shift = 1.25

	Chart	ARL1	SD	Lambda	shift
1	EWMA	6.53	4.4	0.2000	1.25
2	at	6.74	5.7	0.1000	1.25
3	DEWMA	6.81	5.0	0.3000	1.25
4	Ft	6.85	7.8	0.1000	1.25
5	EWMA	7.12	4.2	0.1000	1.25
6	at	7.39	3.4	0.0500	1.25
7	Ft	7.41	3.4	0.0500	1.25
8	DEWMA	7.43	12.6	0.5000	1.25
9	DEWMA	7.56	3.0	0.2000	1.25
10	EWMA	7.61	13.8	0.3000	1.25
11	bt	7.82	10.5	0.0500	1.25
12	EWMA	8.17	3.7	0.0500	1.25
13	at	8.23	17.8	0.2000	1.25
14	bt	9.85	5.3	0.0100	1.25
15	DEWMA	10.11	3.6	0.1000	1.25
16	Ft	10.22	27.9	0.2000	1.25
17	at	10.57	8.2	0.0100	1.25
18	Ft	10.58	7.8	0.0100	1.25
19	bt	11.76	12.7	0.0050	1.25
20	EWMA	12.57	33.6	0.5000	1.25
21	Ft	13.31	20.5	0.0050	1.25
22	at	13.40	20.7	0.0050	1.25
23	EWMA	13.75	19.7	0.0100	1.25
24	DEWMA	14.68	11.0	0.0500	1.25
25	at	15.15	42.4	0.3000	1.25
26	bt	19.04	54.4	0.1000	1.25
27	EWMA	24.15	48.9	0.0050	1.25
28	Ft	25.68	64.9	0.3000	1.25
29	bt	30.67	65.3	0.0010	1.25
30	Ft	33.86	70.6	0.0010	1.25
31	at	34.30	71.1	0.0010	1.25
32	bt	38.71	77.3	0.0005	1.25
33	at	39.06	81.7	0.5000	1.25
34	Ft	40.93	80.2	0.0005	1.25
35	at	41.01	80.3	0.0005	1.25
36	Shewhart	86.50	116.7	0.0100	1.25
37	Shewhart	86.84	116.9	0.3000	1.25
38	Shewhart	86.88	117.0	0.1000	1.25
39	Shewhart	87.77	117.5	0.5000	1.25
40	Shewhart	87.91	117.6	0.0050	1.25
41	Shewhart	88.10	117.6	0.2000	1.25
42	Shewhart	88.13	117.6	0.0005	1.25
43	Shewhart	88.55	117.7	0.0010	1.25
44	Shewhart	89.48	118.1	0.0500	1.25
45	EWMA	117.19	122.2	0.0010	1.25
46	bt	119.01	130.7	0.2000	1.25
47	DEWMA	178.12	122.2	0.0100	1.25
48	EWMA	185.13	117.7	0.0005	1.25
49	bt	189.07	122.1	0.3000	1.25
50	DEWMA	224.67	98.0	0.0050	1.25
51	bt	238.47	85.7	0.5000	1.25
52	Ft	248.10	71.8	0.5000	1.25
53	DEWMA	270.00	0.0	0.0005	1.25
54	DEWMA	270.00	0.0	0.0010	1.25

Table D4-50

	Chart	ARL1	SD	Lambda
1	EWMA	6.52	5.1	0.2000
2	at	6.82	6.8	0.1000
3	DEWMA	6.83	5.0	0.3000
4	Ft	6.90	7.8	0.1000
5	EWMA	7.17	5.0	0.1000
6	EWMA	7.31	10.1	0.3000
7	at	7.33	3.3	0.0500
8	Ft	7.33	3.4	0.0500
9	DEWMA	7.42	13.4	0.5000
10	DEWMA	7.55	3.0	0.2000
11	bt	7.85	11.5	0.0500
12	EWMA	8.11	3.6	0.0500
13	at	8.57	20.5	0.2000
14	bt	9.84	5.3	0.0100
15	DEWMA	10.15	4.4	0.1000
16	at	10.50	7.3	0.0100
17	Ft	10.57	30.0	0.2000
18	Ft	10.57	7.7	0.0100
19	bt	11.76	11.8	0.0050
20	EWMA	12.26	32.9	0.5000
21	EWMA	13.27	16.0	0.0100
22	Ft	13.58	21.6	0.0050
23	at	13.69	21.9	0.0050
24	at	14.06	38.9	0.3000
25	DEWMA	14.45	8.6	0.0500
26	bt	20.57	57.8	0.1000
27	EWMA	24.34	49.0	0.0050
28	Ft	25.08	63.8	0.3000
29	bt	29.90	64.0	0.0010
30	Ft	33.34	69.8	0.0010
31	at	33.75	70.3	0.0010
32	bt	38.10	76.4	0.0005
33	at	38.70	81.3	0.5000
34	at	40.32	79.5	0.0005
35	Ft	40.55	79.8	0.0005
36	Shewhart	86.33	116.9	0.0050
37	Shewhart	86.49	116.8	0.0010
38	Shewhart	86.82	117.1	0.0100
39	Shewhart	87.31	117.2	0.5000
40	Shewhart	87.47	117.3	0.1000
41	Shewhart	88.08	117.5	0.0500
42	Shewhart	88.10	117.6	0.3000
43	Shewhart	89.35	118.1	0.0005
44	Shewhart	89.42	118.2	0.2000
45	EWMA	116.92	122.2	0.0010
46	bt	120.58	130.9	0.2000
47	DEWMA	176.06	122.8	0.0100
48	EWMA	185.15	117.7	0.0005
49	bt	188.08	122.5	0.3000
50	DEWMA	227.11	96.0	0.0050
51	bt	238.87	85.2	0.5000
52	Ft	247.83	72.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-51

Average running length under shift = 1.3

	Chart	ARL1	SD	Lambda	shift
1	EWMA	6.20	5.6	0.2000	1.3
2	DEWMA	6.39	3.9	0.3000	1.3
3	at	6.42	4.9	0.1000	1.3
4	Ft	6.42	4.2	0.1000	1.3
5	DEWMA	6.77	10.0	0.5000	1.3
6	EWMA	6.82	3.1	0.1000	1.3
7	EWMA	6.83	10.3	0.3000	1.3
8	at	6.97	3.1	0.0500	1.3
9	Ft	6.99	3.2	0.0500	1.3
10	bt	7.09	6.3	0.0500	1.3
11	DEWMA	7.25	2.8	0.2000	1.3
12	at	7.27	13.8	0.2000	1.3
13	EWMA	7.74	3.4	0.0500	1.3
14	Ft	8.68	22.7	0.2000	1.3
15	bt	9.42	5.2	0.0100	1.3
16	DEWMA	9.88	3.4	0.1000	1.3
17	at	10.09	7.1	0.0100	1.3
18	Ft	10.13	7.2	0.0100	1.3
19	bt	11.02	8.4	0.0050	1.3
20	EWMA	11.09	29.9	0.5000	1.3
21	Ft	12.31	15.9	0.0050	1.3
22	at	12.34	35.1	0.3000	1.3
23	at	12.36	15.9	0.0050	1.3
24	EWMA	12.58	14.2	0.0100	1.3
25	DEWMA	13.95	5.8	0.0500	1.3
26	bt	16.00	48.1	0.1000	1.3
27	Ft	20.39	55.8	0.3000	1.3
28	EWMA	21.37	42.5	0.0050	1.3
29	bt	26.10	57.3	0.0010	1.3
30	Ft	29.76	64.3	0.0010	1.3
31	at	30.03	64.6	0.0010	1.3
32	at	32.57	73.6	0.5000	1.3
33	bt	35.51	73.0	0.0005	1.3
34	at	37.57	76.0	0.0005	1.3
35	Ft	37.75	76.3	0.0005	1.3
36	Shewhart	76.26	111.8	0.0500	1.3
37	Shewhart	77.02	112.2	0.3000	1.3
38	Shewhart	77.38	112.5	0.0050	1.3
39	Shewhart	77.94	112.9	0.0005	1.3
40	Shewhart	78.55	112.9	0.1000	1.3
41	Shewhart	78.65	113.1	0.5000	1.3
42	Shewhart	78.90	113.4	0.0100	1.3
43	Shewhart	78.99	113.3	0.2000	1.3
44	Shewhart	79.77	113.7	0.0010	1.3
45	EWMA	107.97	119.9	0.0010	1.3
46	bt	111.10	129.4	0.2000	1.3
47	DEWMA	173.88	123.1	0.0100	1.3
48	EWMA	179.20	119.5	0.0005	1.3
49	bt	183.26	124.5	0.3000	1.3
50	DEWMA	225.49	97.3	0.0050	1.3
51	bt	236.15	88.4	0.5000	1.3
52	Ft	245.27	75.8	0.5000	1.3
53	DEWMA	270.00	0.0	0.0005	1.3
54	DEWMA	270.00	0.0	0.0010	1.3

Table D4-51

	Chart	ARL1	SD	Lambda
1	EWMA	6.16	4.2	0.2000
2	at	6.39	4.1	0.1000
3	Ft	6.42	4.2	0.1000
4	DEWMA	6.42	4.0	0.3000
5	EWMA	6.58	6.1	0.3000
6	EWMA	6.77	3.1	0.1000
7	DEWMA	6.78	10.6	0.5000
8	at	6.92	3.1	0.0500
9	Ft	6.93	3.2	0.0500
10	at	7.09	12.0	0.2000
11	bt	7.12	6.8	0.0500
12	DEWMA	7.26	3.9	0.2000
13	EWMA	7.68	3.5	0.0500
14	Ft	8.87	23.8	0.2000
15	bt	9.46	5.8	0.0100
16	DEWMA	9.82	3.5	0.1000
17	at	10.05	6.2	0.0100
18	Ft	10.12	6.7	0.0100
19	EWMA	10.57	27.9	0.5000
20	bt	11.16	9.2	0.0050
21	at	12.12	34.2	0.3000
22	at	12.38	15.7	0.0050
23	Ft	12.44	16.7	0.0050
24	EWMA	12.59	14.2	0.0100
25	DEWMA	13.93	7.8	0.0500
26	bt	16.46	49.2	0.1000
27	EWMA	21.39	42.5	0.0050
28	Ft	22.06	59.2	0.3000
29	bt	25.98	57.0	0.0010
30	Ft	29.50	63.7	0.0010
31	at	29.63	63.8	0.0010
32	at	32.22	73.3	0.5000
33	bt	35.31	73.0	0.0005
34	at	37.04	75.5	0.0005
35	Ft	37.46	76.2	0.0005
36	Shewhart	75.65	111.3	0.0100
37	Shewhart	76.09	111.7	0.0005
38	Shewhart	77.09	112.2	0.1000
39	Shewhart	77.75	112.6	0.0010
40	Shewhart	77.91	112.8	0.5000
41	Shewhart	78.97	113.1	0.2000
42	Shewhart	79.07	113.3	0.0050
43	Shewhart	79.14	113.4	0.0500
44	Shewhart	79.46	113.3	0.3000
45	EWMA	108.37	120.0	0.0010
46	bt	111.12	129.4	0.2000
47	DEWMA	172.13	123.6	0.0100
48	EWMA	175.40	120.5	0.0005
49	bt	187.32	122.8	0.3000
50	DEWMA	226.69	96.2	0.0050
51	bt	234.20	90.5	0.5000
52	Ft	245.04	76.1	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-52

Average running length under shift = 1.4

	Chart	ARL1	SD	Lambda	shift
1	EWMA	5.47	2.8	0.2000	1.4
2	EWMA	5.71	3.4	0.3000	1.4
3	DEWMA	5.72	5.1	0.5000	1.4
4	at	5.74	2.7	0.1000	1.4
5	Ft	5.75	2.8	0.1000	1.4
6	DEWMA	5.83	2.5	0.3000	1.4
7	at	5.98	8.3	0.2000	1.4
8	EWMA	6.23	2.8	0.1000	1.4
9	bt	6.32	3.0	0.0500	1.4
10	Ft	6.39	2.9	0.0500	1.4
11	at	6.40	2.8	0.0500	1.4
12	Ft	6.53	13.5	0.2000	1.4
13	DEWMA	6.71	2.4	0.2000	1.4
14	EWMA	7.12	3.1	0.0500	1.4
15	EWMA	7.59	16.1	0.5000	1.4
16	at	8.28	21.1	0.3000	1.4
17	bt	8.74	4.1	0.0100	1.4
18	at	9.27	4.5	0.0100	1.4
19	DEWMA	9.34	3.2	0.1000	1.4
20	Ft	9.34	5.3	0.0100	1.4
21	bt	10.20	6.8	0.0050	1.4
22	bt	10.72	34.3	0.1000	1.4
23	at	11.08	11.0	0.0050	1.4
24	Ft	11.10	11.6	0.0050	1.4
25	EWMA	11.40	10.5	0.0100	1.4
26	DEWMA	13.29	5.6	0.0500	1.4
27	Ft	13.82	42.0	0.3000	1.4
28	EWMA	17.38	32.3	0.0050	1.4
29	bt	20.16	44.9	0.0010	1.4
30	at	21.10	55.6	0.5000	1.4
31	Ft	22.75	51.4	0.0010	1.4
32	at	22.95	51.6	0.0010	1.4
33	bt	27.57	61.0	0.0005	1.4
34	at	29.48	64.5	0.0005	1.4
35	Ft	29.64	64.8	0.0005	1.4
36	Shewhart	57.74	99.4	0.3000	1.4
37	Shewhart	58.00	99.7	0.0010	1.4
38	Shewhart	58.76	100.2	0.2000	1.4
39	Shewhart	58.96	100.3	0.5000	1.4
40	Shewhart	58.99	100.5	0.0005	1.4
41	Shewhart	59.14	100.5	0.0100	1.4
42	Shewhart	59.23	100.6	0.0500	1.4
43	Shewhart	59.47	100.8	0.1000	1.4
44	Shewhart	60.63	102.0	0.0050	1.4
45	EWMA	89.81	112.9	0.0010	1.4
46	bt	92.22	124.3	0.2000	1.4
47	EWMA	158.39	123.5	0.0005	1.4
48	DEWMA	164.82	125.0	0.0100	1.4
49	bt	167.97	129.1	0.3000	1.4
50	DEWMA	222.95	99.4	0.0050	1.4
51	bt	231.17	93.7	0.5000	1.4
52	Ft	237.79	85.1	0.5000	1.4
53	DEWMA	270.00	0.0	0.0005	1.4
54	DEWMA	270.00	0.0	0.0010	1.4

Table D4-52

	Chart	ARL1	SD	Lambda
1	EWMA	5.54	2.9	0.2000
2	at	5.73	2.7	0.1000
3	Ft	5.73	2.8	0.1000
4	DEWMA	5.77	6.3	0.5000
5	DEWMA	5.88	2.6	0.3000
6	EWMA	5.90	6.3	0.3000
7	at	6.02	8.3	0.2000
8	EWMA	6.18	2.8	0.1000
9	bt	6.39	4.1	0.0500
10	at	6.40	2.8	0.0500
11	Ft	6.41	2.8	0.0500
12	Ft	6.63	13.5	0.2000
13	DEWMA	6.75	2.5	0.2000
14	EWMA	7.14	3.1	0.0500
15	EWMA	7.75	16.9	0.5000
16	at	8.64	23.0	0.3000
17	bt	8.72	4.1	0.0100
18	DEWMA	9.28	3.2	0.1000
19	at	9.33	5.8	0.0100
20	Ft	9.34	5.2	0.0100
21	bt	10.14	5.7	0.0050
22	bt	10.70	34.0	0.1000
23	Ft	10.94	9.8	0.0050
24	at	10.96	9.4	0.0050
25	EWMA	11.40	9.9	0.0100
26	DEWMA	13.28	5.0	0.0500
27	Ft	13.68	41.1	0.3000
28	EWMA	17.18	31.3	0.0050
29	bt	20.88	47.0	0.0010
30	at	22.09	57.7	0.5000
31	Ft	23.69	53.6	0.0010
32	at	23.76	53.6	0.0010
33	bt	26.46	58.9	0.0005
34	at	28.02	61.9	0.0005
35	Ft	28.33	62.5	0.0005
36	Shewhart	58.17	99.9	0.0010
37	Shewhart	58.34	99.9	0.0100
38	Shewhart	59.23	100.5	0.0005
39	Shewhart	59.34	100.5	0.1000
40	Shewhart	59.56	101.0	0.5000
41	Shewhart	59.87	101.3	0.2000
42	Shewhart	60.45	101.7	0.3000
43	Shewhart	60.54	101.7	0.0050
44	Shewhart	60.65	101.7	0.0500
45	EWMA	89.97	113.1	0.0010
46	bt	91.19	123.8	0.2000
47	EWMA	157.10	123.6	0.0005
48	DEWMA	166.85	124.7	0.0100
49	bt	169.59	128.8	0.3000
50	DEWMA	223.43	98.9	0.0050
51	bt	230.48	94.4	0.5000
52	Ft	237.71	85.3	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-53

Average running length under shift = 1.5

	Chart	ARL1	SD	Lambda	Shift
1	EWMA	5.01	2.5	0.2000	1.5
2	DEWMA	5.05	3.9	0.5000	1.5
3	EWMA	5.13	3.0	0.3000	1.5
4	at	5.19	4.8	0.2000	1.5
5	at	5.22	2.4	0.1000	1.5
6	Ft	5.22	2.5	0.1000	1.5
7	DEWMA	5.40	2.3	0.3000	1.5
8	Ft	5.41	7.3	0.2000	1.5
9	EWMA	5.69	2.5	0.1000	1.5
10	bt	5.82	2.7	0.0500	1.5
11	Ft	5.94	2.6	0.0500	1.5
12	at	5.94	2.5	0.0500	1.5
13	EWMA	6.20	11.3	0.5000	1.5
14	DEWMA	6.31	2.3	0.2000	1.5
15	at	6.50	14.6	0.3000	1.5
16	EWMA	6.63	2.9	0.0500	1.5
17	bt	6.97	19.1	0.1000	1.5
18	bt	8.08	3.8	0.0100	1.5
19	at	8.60	4.2	0.0100	1.5
20	Ft	8.62	4.2	0.0100	1.5
21	DEWMA	8.85	3.0	0.1000	1.5
22	Ft	9.25	28.8	0.3000	1.5
23	bt	9.44	5.4	0.0050	1.5
24	Ft	10.09	7.6	0.0050	1.5
25	at	10.11	7.1	0.0050	1.5
26	EWMA	10.35	5.8	0.0100	1.5
27	DEWMA	12.68	4.7	0.0500	1.5
28	EWMA	14.21	20.6	0.0050	1.5
29	at	14.58	42.1	0.5000	1.5
30	bt	15.84	33.1	0.0010	1.5
31	Ft	17.80	39.6	0.0010	1.5
32	at	17.96	39.8	0.0010	1.5
33	bt	21.52	48.9	0.0005	1.5
34	at	22.93	52.2	0.0005	1.5
35	Ft	23.07	52.5	0.0005	1.5
36	Shewhart	41.51	84.5	0.2000	1.5
37	Shewhart	43.42	86.7	0.1000	1.5
38	Shewhart	43.72	87.1	0.3000	1.5
39	Shewhart	43.81	86.9	0.0010	1.5
40	Shewhart	43.88	86.9	0.0005	1.5
41	Shewhart	44.02	87.2	0.0100	1.5
42	Shewhart	44.66	87.9	0.0050	1.5
43	Shewhart	44.71	87.9	0.0500	1.5
44	Shewhart	45.07	88.4	0.5000	1.5
45	bt	71.85	115.0	0.2000	1.5
46	EWMA	74.64	104.6	0.0010	1.5
47	EWMA	142.03	124.2	0.0005	1.5
48	bt	153.19	131.9	0.3000	1.5
49	DEWMA	158.61	125.8	0.0100	1.5
50	DEWMA	220.70	101.0	0.0050	1.5
51	bt	223.07	101.3	0.5000	1.5
52	Ft	226.81	96.2	0.5000	1.5
53	DEWMA	270.00	0.0	0.0005	1.5
54	DEWMA	270.00	0.0	0.0010	1.5

Table D4-53

	Chart	ARL1	SD	Lambda
1	DEWMA	4.96	2.8	0.5000
2	EWMA	4.99	2.5	0.2000
3	EWMA	5.11	2.9	0.3000
4	at	5.16	4.0	0.2000
5	Ft	5.24	2.5	0.1000
6	at	5.25	2.4	0.1000
7	DEWMA	5.39	2.2	0.3000
8	Ft	5.47	8.2	0.2000
9	EWMA	5.72	2.5	0.1000
10	bt	5.88	4.6	0.0500
11	at	5.91	2.5	0.0500
12	Ft	5.91	2.6	0.0500
13	EWMA	6.12	10.7	0.5000
14	DEWMA	6.29	2.3	0.2000
15	at	6.36	13.1	0.3000
16	EWMA	6.60	2.9	0.0500
17	bt	7.15	20.2	0.1000
18	bt	8.13	3.8	0.0100
19	at	8.66	4.2	0.0100
20	Ft	8.69	4.2	0.0100
21	DEWMA	8.86	3.0	0.1000
22	Ft	9.21	28.6	0.3000
23	bt	9.48	4.7	0.0050
24	Ft	10.23	8.4	0.0050
25	at	10.24	8.0	0.0050
26	EWMA	10.43	6.8	0.0100
27	DEWMA	12.65	5.4	0.0500
28	at	13.91	40.3	0.5000
29	EWMA	14.57	22.4	0.0050
30	bt	16.76	36.5	0.0010
31	Ft	18.75	42.6	0.0010
32	at	18.89	42.7	0.0010
33	bt	22.02	50.4	0.0005
34	Ft	23.29	53.3	0.0005
35	at	23.31	53.3	0.0005
36	Shewhart	42.67	85.5	0.0100
37	Shewhart	42.79	85.9	0.2000
38	Shewhart	43.65	86.8	0.0500
39	Shewhart	43.82	87.0	0.3000
40	Shewhart	43.91	87.3	0.5000
41	Shewhart	43.97	87.3	0.0050
42	Shewhart	43.98	87.1	0.0010
43	Shewhart	44.44	87.8	0.1000
44	Shewhart	44.77	88.2	0.0005
45	bt	73.06	115.8	0.2000
46	EWMA	73.90	104.1	0.0010
47	EWMA	141.54	124.2	0.0005
48	bt	151.71	132.1	0.3000
49	DEWMA	159.04	125.6	0.0100
50	DEWMA	219.97	101.6	0.0050
51	bt	224.38	100.2	0.5000
52	Ft	227.01	96.0	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-54

Average running length under shift = 1.6

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	4.52	2.4	0.5000	1.6
2	EWMA	4.58	2.2	0.2000	1.6
3	at	4.61	2.6	0.2000	1.6
4	EWMA	4.64	2.5	0.3000	1.6
5	Ft	4.70	2.8	0.2000	1.6
6	Ft	4.81	2.2	0.1000	1.6
7	at	4.81	2.1	0.1000	1.6
8	DEWMA	5.05	2.0	0.3000	1.6
9	at	5.21	6.9	0.3000	1.6
10	EWMA	5.25	6.4	0.5000	1.6
11	EWMA	5.28	2.2	0.1000	1.6
12	bt	5.42	2.4	0.0500	1.6
13	at	5.53	2.3	0.0500	1.6
14	Ft	5.54	2.4	0.0500	1.6
15	DEWMA	5.96	2.0	0.2000	1.6
16	bt	6.16	17.0	0.1000	1.6
17	EWMA	6.20	2.6	0.0500	1.6
18	Ft	6.42	16.0	0.3000	1.6
19	bt	7.62	3.5	0.0100	1.6
20	at	8.09	3.8	0.0100	1.6
21	Ft	8.14	3.9	0.0100	1.6
22	DEWMA	8.42	2.8	0.1000	1.6
23	bt	8.89	4.4	0.0050	1.6
24	at	9.15	25.5	0.5000	1.6
25	Ft	9.45	5.8	0.0050	1.6
26	at	9.49	5.7	0.0050	1.6
27	EWMA	9.77	6.0	0.0100	1.6
28	DEWMA	12.15	4.4	0.0500	1.6
29	EWMA	13.07	17.4	0.0050	1.6
30	bt	14.34	29.4	0.0010	1.6
31	Ft	15.84	34.9	0.0010	1.6
32	at	16.05	35.4	0.0010	1.6
33	bt	17.42	39.0	0.0005	1.6
34	at	18.39	41.8	0.0005	1.6
35	Ft	18.66	42.7	0.0005	1.6
36	Shewhart	29.63	69.7	0.5000	1.6
37	Shewhart	30.18	70.4	0.0010	1.6
38	Shewhart	30.20	70.7	0.0050	1.6
39	Shewhart	30.99	71.8	0.0100	1.6
40	Shewhart	31.19	72.0	0.1000	1.6
41	Shewhart	31.42	72.4	0.3000	1.6
42	Shewhart	31.43	72.3	0.0500	1.6
43	Shewhart	31.64	72.7	0.2000	1.6
44	Shewhart	31.91	73.0	0.0005	1.6
45	bt	56.18	104.8	0.2000	1.6
46	EWMA	60.09	93.6	0.0010	1.6
47	EWMA	124.10	122.5	0.0005	1.6
48	bt	139.38	133.0	0.3000	1.6
49	DEWMA	151.00	126.4	0.0100	1.6
50	Ft	213.56	106.6	0.5000	1.6
51	bt	218.53	105.0	0.5000	1.6
52	DEWMA	219.34	102.1	0.0050	1.6
53	DEWMA	270.00	0.0	0.0005	1.6
54	DEWMA	270.00	0.0	0.0010	1.6

Table D4-54

	Chart	ARL1	SD	Lambda
1	DEWMA	4.55	2.4	0.5000
2	EWMA	4.56	2.1	0.2000
3	at	4.57	2.5	0.2000
4	Ft	4.63	2.8	0.2000
5	EWMA	4.63	2.5	0.3000
6	Ft	4.82	2.3	0.1000
7	at	4.83	2.2	0.1000
8	DEWMA	5.02	2.0	0.3000
9	EWMA	5.21	6.3	0.5000
10	EWMA	5.29	2.3	0.1000
11	at	5.33	9.4	0.3000
12	bt	5.38	2.4	0.0500
13	at	5.50	2.3	0.0500
14	Ft	5.51	2.4	0.0500
15	bt	5.86	14.6	0.1000
16	DEWMA	5.94	2.0	0.2000
17	EWMA	6.19	2.6	0.0500
18	Ft	6.89	19.9	0.3000
19	bt	7.60	3.6	0.0100
20	at	8.08	3.9	0.0100
21	Ft	8.12	3.9	0.0100
22	DEWMA	8.45	2.8	0.1000
23	bt	8.80	4.4	0.0050
24	Ft	9.37	5.7	0.0050
25	at	9.41	5.7	0.0050
26	EWMA	9.70	4.8	0.0100
27	at	10.07	29.3	0.5000
28	DEWMA	12.19	4.5	0.0500
29	EWMA	12.58	14.1	0.0050
30	bt	14.24	28.5	0.0010
31	Ft	15.37	32.7	0.0010
32	at	15.63	33.4	0.0010
33	bt	17.55	39.3	0.0005
34	at	18.64	42.5	0.0005
35	Ft	18.65	42.6	0.0005
36	Shewhart	30.32	70.9	0.0010
37	Shewhart	30.96	71.6	0.0005
38	Shewhart	31.09	71.9	0.0500
39	Shewhart	31.44	72.5	0.0050
40	Shewhart	32.06	73.3	0.1000
41	Shewhart	32.11	73.2	0.3000
42	Shewhart	32.52	73.8	0.5000
43	Shewhart	32.53	73.9	0.0100
44	Shewhart	32.92	74.5	0.2000
45	bt	56.22	104.9	0.2000
46	EWMA	60.32	93.8	0.0010
47	EWMA	122.09	122.0	0.0005
48	bt	141.55	133.0	0.3000
49	DEWMA	149.27	126.3	0.0100
50	Ft	215.34	105.3	0.5000
51	DEWMA	217.75	103.2	0.0050
52	bt	220.29	103.7	0.5000
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-55

Average running length under shift = 1.7

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	4.14	2.1	0.5000	1.7
2	at	4.18	2.2	0.2000	1.7
3	EWMA	4.21	2.2	0.3000	1.7
4	EWMA	4.23	1.9	0.2000	1.7
5	Ft	4.23	2.4	0.2000	1.7
6	Ft	4.46	2.0	0.1000	1.7
7	at	4.47	3.0	0.3000	1.7
8	at	4.47	1.9	0.1000	1.7
9	EWMA	4.54	3.9	0.5000	1.7
10	DEWMA	4.71	1.8	0.3000	1.7
11	bt	4.91	8.4	0.1000	1.7
12	EWMA	4.93	2.1	0.1000	1.7
13	bt	5.01	2.2	0.0500	1.7
14	Ft	5.13	2.2	0.0500	1.7
15	at	5.14	2.1	0.0500	1.7
16	Ft	5.24	11.8	0.3000	1.7
17	DEWMA	5.64	1.9	0.2000	1.7
18	EWMA	5.77	2.4	0.0500	1.7
19	bt	7.15	3.3	0.0100	1.7
20	at	7.16	18.9	0.5000	1.7
21	at	7.64	3.7	0.0100	1.7
22	Ft	7.67	3.7	0.0100	1.7
23	DEWMA	8.06	2.7	0.1000	1.7
24	bt	8.41	4.2	0.0050	1.7
25	Ft	8.92	5.5	0.0050	1.7
26	at	8.96	5.5	0.0050	1.7
27	EWMA	9.16	4.5	0.0100	1.7
28	DEWMA	11.60	4.3	0.0500	1.7
29	EWMA	11.72	11.3	0.0050	1.7
30	bt	12.21	21.1	0.0010	1.7
31	Ft	13.37	26.7	0.0010	1.7
32	at	13.48	26.8	0.0010	1.7
33	bt	15.09	32.7	0.0005	1.7
34	at	16.20	36.5	0.0005	1.7
35	Ft	16.26	36.8	0.0005	1.7
36	Shewhart	20.84	55.3	0.0100	1.7
37	Shewhart	21.03	55.7	0.5000	1.7
38	Shewhart	21.28	56.2	0.0005	1.7
39	Shewhart	21.47	56.5	0.1000	1.7
40	Shewhart	21.51	56.3	0.0010	1.7
41	Shewhart	21.78	57.2	0.2000	1.7
42	Shewhart	21.95	57.7	0.0500	1.7
43	Shewhart	22.57	58.9	0.0050	1.7
44	Shewhart	22.80	59.1	0.3000	1.7
45	bt	44.41	94.9	0.2000	1.7
46	EWMA	49.81	83.9	0.0010	1.7
47	EWMA	104.68	117.6	0.0005	1.7
48	bt	125.09	132.6	0.3000	1.7
49	DEWMA	142.16	126.4	0.0100	1.7
50	Ft	200.33	114.5	0.5000	1.7
51	bt	210.26	111.1	0.5000	1.7
52	DEWMA	215.94	104.3	0.0050	1.7
53	DEWMA	270.00	0.0	0.0005	1.7
54	DEWMA	270.00	0.0	0.0010	1.7

Table D4-55

	Chart	ARL1	SD	Lambda
1	DEWMA	4.16	2.1	0.5000
2	at	4.21	2.2	0.2000
3	EWMA	4.21	2.2	0.3000
4	EWMA	4.25	1.9	0.2000
5	Ft	4.31	4.5	0.2000
6	Ft	4.42	1.9	0.1000
7	at	4.43	1.9	0.1000
8	at	4.54	4.8	0.3000
9	EWMA	4.61	4.0	0.5000
10	DEWMA	4.71	1.8	0.3000
11	EWMA	4.90	2.0	0.1000
12	bt	4.94	9.5	0.1000
13	bt	5.07	2.2	0.0500
14	at	5.21	2.1	0.0500
15	Ft	5.23	2.2	0.0500
16	Ft	5.46	13.5	0.3000
17	DEWMA	5.67	1.9	0.2000
18	EWMA	5.88	2.5	0.0500
19	bt	7.18	3.3	0.0100
20	at	7.19	18.2	0.5000
21	at	7.65	3.7	0.0100
22	Ft	7.68	3.7	0.0100
23	DEWMA	8.03	2.7	0.1000
24	bt	8.45	4.2	0.0050
25	Ft	8.99	5.5	0.0050
26	at	9.02	5.5	0.0050
27	EWMA	9.18	4.6	0.0100
28	EWMA	11.72	10.4	0.0050
29	DEWMA	11.80	4.2	0.0500
30	bt	12.03	19.6	0.0010
31	Ft	13.03	24.7	0.0010
32	at	13.12	24.7	0.0010
33	bt	14.63	30.5	0.0005
34	at	15.38	33.2	0.0005
35	Ft	15.56	33.9	0.0005
36	Shewhart	20.90	55.3	0.0005
37	Shewhart	21.14	56.1	0.0010
38	Shewhart	21.66	57.3	0.0100
39	Shewhart	21.71	57.0	0.2000
40	Shewhart	21.93	57.2	0.0050
41	Shewhart	22.13	57.9	0.0500
42	Shewhart	22.44	58.3	0.5000
43	Shewhart	22.62	59.0	0.1000
44	Shewhart	22.67	59.1	0.3000
45	bt	43.13	93.6	0.2000
46	EWMA	49.54	83.6	0.0010
47	EWMA	106.64	118.1	0.0005
48	bt	122.02	132.2	0.3000
49	DEWMA	142.05	126.4	0.0100
50	Ft	199.66	114.9	0.5000
51	bt	212.19	109.8	0.5000
52	DEWMA	216.21	104.0	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-56

Average running length under shift = 1.8

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	3.84	1.8	0.5000	1.8
2	at	3.86	2.0	0.2000	1.8
3	EWMA	3.88	1.9	0.3000	1.8
4	Ft	3.93	3.4	0.2000	1.8
5	EWMA	3.95	1.8	0.2000	1.8
6	at	4.05	2.6	0.3000	1.8
7	EWMA	4.09	2.6	0.5000	1.8
8	Ft	4.17	1.8	0.1000	1.8
9	at	4.18	1.8	0.1000	1.8
10	Ft	4.41	6.2	0.3000	1.8
11	bt	4.44	6.9	0.1000	1.8
12	DEWMA	4.46	1.6	0.3000	1.8
13	EWMA	4.63	1.9	0.1000	1.8
14	bt	4.69	2.0	0.0500	1.8
15	Ft	4.85	2.0	0.0500	1.8
16	at	4.85	2.0	0.0500	1.8
17	DEWMA	5.39	1.8	0.2000	1.8
18	EWMA	5.46	2.2	0.0500	1.8
19	at	5.66	11.7	0.5000	1.8
20	bt	6.76	3.0	0.0100	1.8
21	at	7.22	3.4	0.0100	1.8
22	Ft	7.25	3.4	0.0100	1.8
23	DEWMA	7.75	2.6	0.1000	1.8
24	bt	7.91	3.9	0.0050	1.8
25	Ft	8.38	4.6	0.0050	1.8
26	at	8.41	4.5	0.0050	1.8
27	EWMA	8.69	5.0	0.0100	1.8
28	EWMA	10.80	7.1	0.0050	1.8
29	bt	11.04	16.9	0.0010	1.8
30	DEWMA	11.29	4.1	0.0500	1.8
31	Ft	12.01	22.5	0.0010	1.8
32	at	12.07	22.3	0.0010	1.8
33	bt	12.46	23.1	0.0005	1.8
34	at	13.09	26.1	0.0005	1.8
35	Ft	13.11	26.2	0.0005	1.8
36	Shewhart	14.65	42.2	0.2000	1.8
37	Shewhart	14.96	42.5	0.1000	1.8
38	Shewhart	15.10	43.6	0.0010	1.8
39	Shewhart	15.44	44.2	0.0100	1.8
40	Shewhart	15.46	44.3	0.0005	1.8
41	Shewhart	15.48	44.2	0.0500	1.8
42	Shewhart	15.64	44.9	0.5000	1.8
43	Shewhart	15.73	45.0	0.3000	1.8
44	Shewhart	15.74	45.0	0.0050	1.8
45	bt	31.38	80.4	0.2000	1.8
46	EWMA	39.85	72.0	0.0010	1.8
47	EWMA	88.12	110.7	0.0005	1.8
48	bt	107.06	129.8	0.3000	1.8
49	DEWMA	136.94	126.2	0.0100	1.8
50	Ft	184.72	121.5	0.5000	1.8
51	bt	203.55	115.3	0.5000	1.8
52	DEWMA	211.45	107.1	0.0050	1.8
53	DEWMA	270.00	0.0	0.0005	1.8
54	DEWMA	270.00	0.0	0.0010	1.8

Table D4-56

	Chart	ARL1	SD	Lambda
1	DEWMA	3.82	1.8	0.5000
2	at	3.83	1.9	0.2000
3	EWMA	3.85	1.9	0.3000
4	Ft	3.86	2.1	0.2000
5	EWMA	3.92	1.8	0.2000
6	at	3.98	2.5	0.3000
7	EWMA	4.10	2.6	0.5000
8	Ft	4.16	1.8	0.1000
9	at	4.17	1.7	0.1000
10	Ft	4.30	6.1	0.3000
11	bt	4.31	3.5	0.1000
12	DEWMA	4.43	1.6	0.3000
13	EWMA	4.62	1.9	0.1000
14	bt	4.69	2.0	0.0500
15	Ft	4.88	2.0	0.0500
16	at	4.88	2.0	0.0500
17	DEWMA	5.39	1.8	0.2000
18	EWMA	5.51	2.3	0.0500
19	at	5.79	13.1	0.5000
20	bt	6.79	3.1	0.0100
21	at	7.24	3.4	0.0100
22	Ft	7.26	3.5	0.0100
23	DEWMA	7.74	2.5	0.1000
24	bt	7.89	3.9	0.0050
25	Ft	8.37	4.6	0.0050
26	at	8.40	4.6	0.0050
27	EWMA	8.72	5.0	0.0100
28	EWMA	10.84	8.0	0.0050
29	bt	10.88	15.7	0.0010
30	DEWMA	11.39	4.1	0.0500
31	Ft	11.61	20.1	0.0010
32	at	11.63	19.6	0.0010
33	bt	13.18	25.9	0.0005
34	Ft	13.94	29.2	0.0005
35	at	13.94	29.2	0.0005
36	Shewhart	14.97	43.1	0.0500
37	Shewhart	15.02	43.4	0.0100
38	Shewhart	15.12	43.0	0.0010
39	Shewhart	15.33	43.7	0.1000
40	Shewhart	15.34	44.3	0.0005
41	Shewhart	15.34	43.9	0.2000
42	Shewhart	16.22	46.7	0.3000
43	Shewhart	16.23	46.4	0.5000
44	Shewhart	16.43	47.0	0.0050
45	bt	30.71	79.6	0.2000
46	EWMA	38.72	70.2	0.0010
47	EWMA	92.01	112.5	0.0005
48	bt	106.04	129.6	0.3000
49	DEWMA	136.34	126.0	0.0100
50	Ft	184.87	121.4	0.5000
51	bt	202.46	115.9	0.5000
52	DEWMA	210.14	108.0	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-57

Average running length under shift = 1.9

	Chart	ARL1	SD	Lambda	shift
1	DEWMA	3.53	1.6	0.5000	1.9
2	at	3.54	1.7	0.2000	1.9
3	EWMA	3.56	1.7	0.3000	1.9
4	Ft	3.57	1.8	0.2000	1.9
5	at	3.60	2.1	0.3000	1.9
6	EWMA	3.65	2.2	0.5000	1.9
7	EWMA	3.66	1.6	0.2000	1.9
8	Ft	3.82	5.3	0.3000	1.9
9	Ft	3.94	1.7	0.1000	1.9
10	at	3.94	1.6	0.1000	1.9
11	bt	4.01	3.3	0.1000	1.9
12	DEWMA	4.23	1.5	0.3000	1.9
13	EWMA	4.38	1.8	0.1000	1.9
14	bt	4.41	1.8	0.0500	1.9
15	Ft	4.57	1.9	0.0500	1.9
16	at	4.58	1.8	0.0500	1.9
17	at	4.61	7.9	0.5000	1.9
18	DEWMA	5.14	1.7	0.2000	1.9
19	EWMA	5.16	2.1	0.0500	1.9
20	bt	6.41	2.9	0.0100	1.9
21	at	6.85	3.2	0.0100	1.9
22	Ft	6.87	3.2	0.0100	1.9
23	DEWMA	7.50	2.4	0.1000	1.9
24	bt	7.51	3.7	0.0050	1.9
25	Ft	7.99	4.3	0.0050	1.9
26	at	8.03	4.3	0.0050	1.9
27	EWMA	8.21	3.9	0.0100	1.9
28	bt	10.17	13.5	0.0010	1.9
29	Shewhart	10.22	29.9	0.5000	1.9
30	EWMA	10.26	5.9	0.0050	1.9
31	Shewhart	10.30	30.4	0.3000	1.9
32	Ft	10.70	16.8	0.0010	1.9
33	Shewhart	10.72	31.9	0.1000	1.9
34	Shewhart	10.77	32.2	0.2000	1.9
35	at	10.79	16.9	0.0010	1.9
36	Shewhart	10.84	31.7	0.0500	1.9
37	DEWMA	10.86	3.9	0.0500	1.9
38	Shewhart	10.94	32.4	0.0050	1.9
39	Shewhart	10.95	32.7	0.0010	1.9
40	Shewhart	10.98	32.6	0.0100	1.9
41	Shewhart	11.05	33.2	0.0005	1.9
42	bt	11.35	18.9	0.0005	1.9
43	Ft	11.83	21.6	0.0005	1.9
44	at	11.87	21.8	0.0005	1.9
45	bt	22.22	67.2	0.2000	1.9
46	EWMA	31.12	58.4	0.0010	1.9
47	EWMA	74.96	103.2	0.0005	1.9
48	bt	89.32	124.5	0.3000	1.9
49	DEWMA	127.56	125.0	0.0100	1.9
50	Ft	167.17	126.6	0.5000	1.9
51	bt	194.08	120.4	0.5000	1.9
52	DEWMA	208.24	109.1	0.0050	1.9
53	DEWMA	270.00	0.0	0.0005	1.9
54	DEWMA	270.00	0.0	0.0010	1.9

Table D4-57

	Chart	ARL1	SD	Lambda
1	DEWMA	3.55	1.6	0.5000
2	at	3.55	1.7	0.2000
3	EWMA	3.56	1.7	0.3000
4	Ft	3.58	1.9	0.2000
5	at	3.61	2.1	0.3000
6	EWMA	3.67	1.6	0.2000
7	EWMA	3.70	2.2	0.5000
8	Ft	3.89	5.9	0.3000
9	Ft	3.91	1.6	0.1000
10	at	3.93	1.6	0.1000
11	bt	4.00	3.3	0.1000
12	DEWMA	4.21	1.5	0.3000
13	EWMA	4.35	1.8	0.1000
14	bt	4.43	1.8	0.0500
15	at	4.59	1.8	0.0500
16	Ft	4.59	1.9	0.0500
17	at	4.74	8.4	0.5000
18	DEWMA	5.14	1.7	0.2000
19	EWMA	5.18	2.1	0.0500
20	bt	6.38	2.9	0.0100
21	at	6.83	3.3	0.0100
22	Ft	6.85	3.3	0.0100
23	DEWMA	7.44	2.4	0.1000
24	bt	7.57	3.7	0.0050
25	Ft	8.06	4.4	0.0050
26	at	8.09	4.3	0.0050
27	EWMA	8.20	4.0	0.0100
28	bt	10.01	11.9	0.0010
29	Shewhart	10.29	30.3	0.1000
30	EWMA	10.31	5.3	0.0050
31	Shewhart	10.36	30.4	0.3000
32	Ft	10.52	15.5	0.0010
33	Shewhart	10.55	30.8	0.2000
34	Shewhart	10.60	31.3	0.0100
35	at	10.61	15.5	0.0010
36	Shewhart	10.64	31.6	0.0050
37	Shewhart	10.75	31.4	0.5000
38	Shewhart	10.76	32.0	0.0500
39	Shewhart	10.83	32.3	0.0010
40	DEWMA	10.89	4.0	0.0500
41	bt	11.13	17.4	0.0005
42	Ft	11.55	19.8	0.0005
43	Shewhart	11.57	34.9	0.0005
44	at	11.65	20.5	0.0005
45	bt	22.76	68.1	0.2000
46	EWMA	32.10	60.4	0.0010
47	EWMA	74.70	102.9	0.0005
48	bt	90.42	125.0	0.3000
49	DEWMA	128.38	125.2	0.0100
50	Ft	165.42	126.9	0.5000
51	bt	194.17	120.3	0.5000
52	DEWMA	210.45	107.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-58

Average running length under shift =2

	Chart	ARL1	SD	Lambda	shift
1	at	3.29	1.5	0.2000	2
2	Ft	3.29	1.6	0.2000	2
3	at	3.32	1.9	0.3000	2
4	EWMA	3.33	1.5	0.3000	2
5	DEWMA	3.34	1.4	0.5000	2
6	EWMA	3.37	2.0	0.5000	2
7	Ft	3.43	2.2	0.3000	2
8	EWMA	3.44	1.4	0.2000	2
9	Ft	3.68	1.5	0.1000	2
10	bt	3.69	1.7	0.1000	2
11	at	3.69	1.5	0.1000	2
12	at	4.01	4.1	0.5000	2
13	DEWMA	4.03	1.4	0.3000	2
14	EWMA	4.13	1.6	0.1000	2
15	bt	4.17	1.7	0.0500	2
16	at	4.34	1.7	0.0500	2
17	Ft	4.34	1.7	0.0500	2
18	EWMA	4.91	2.0	0.0500	2
19	DEWMA	4.95	1.5	0.2000	2
20	bt	6.08	2.8	0.0100	2
21	at	6.49	3.0	0.0100	2
22	Ft	6.51	3.1	0.0100	2
23	bt	7.07	3.4	0.0050	2
24	DEWMA	7.23	2.3	0.1000	2
25	Ft	7.50	4.0	0.0050	2
26	at	7.54	4.0	0.0050	2
27	Shewhart	7.54	19.7	0.3000	2
28	Shewhart	7.66	21.7	0.0010	2
29	Shewhart	7.74	21.1	0.0500	2
30	EWMA	7.77	3.8	0.0100	2
31	Shewhart	7.86	22.2	0.1000	2
32	Shewhart	7.87	21.9	0.0100	2
33	Shewhart	7.96	22.9	0.2000	2
34	Shewhart	8.04	23.2	0.0050	2
35	Shewhart	8.11	22.9	0.0005	2
36	Shewhart	8.18	24.0	0.5000	2
37	bt	9.43	8.8	0.0010	2
38	EWMA	9.63	4.9	0.0050	2
39	Ft	9.93	13.0	0.0010	2
40	at	9.98	12.7	0.0010	2
41	bt	10.39	14.6	0.0005	2
42	DEWMA	10.59	3.8	0.0500	2
43	Ft	10.87	18.0	0.0005	2
44	at	10.91	18.1	0.0005	2
45	bt	15.27	54.4	0.2000	2
46	EWMA	26.28	49.2	0.0010	2
47	EWMA	61.83	93.2	0.0005	2
48	bt	78.61	120.1	0.3000	2
49	DEWMA	119.08	123.6	0.0100	2
50	Ft	148.94	129.1	0.5000	2
51	bt	185.78	124.1	0.5000	2
52	DEWMA	206.32	110.2	0.0050	2
53	DEWMA	270.00	0.0	0.0005	2
54	DEWMA	270.00	0.0	0.0010	2

Table D4-58

	Chart	ARL1	SD	Lambda
1	at	3.29	1.5	0.2000
2	Ft	3.31	1.7	0.2000
3	EWMA	3.35	1.5	0.3000
4	DEWMA	3.35	1.5	0.5000
5	at	3.37	1.9	0.3000
6	EWMA	3.38	2.0	0.5000
7	EWMA	3.45	1.5	0.2000
8	Ft	3.48	2.2	0.3000
9	Ft	3.67	1.5	0.1000
10	at	3.68	1.5	0.1000
11	bt	3.70	1.7	0.1000
12	DEWMA	4.04	1.3	0.3000
13	at	4.08	4.9	0.5000
14	EWMA	4.10	1.6	0.1000
15	bt	4.21	1.7	0.0500
16	Ft	4.37	1.8	0.0500
17	at	4.37	1.7	0.0500
18	EWMA	4.94	2.0	0.0500
19	DEWMA	4.96	1.6	0.2000
20	bt	6.12	2.7	0.0100
21	at	6.56	3.1	0.0100
22	Ft	6.59	3.1	0.0100
23	bt	7.17	3.5	0.0050
24	DEWMA	7.21	2.3	0.1000
25	Shewhart	7.60	20.7	0.2000
26	Ft	7.64	4.1	0.0050
27	at	7.67	4.1	0.0050
28	Shewhart	7.76	21.2	0.0500
29	Shewhart	7.84	21.7	0.0100
30	EWMA	7.88	3.8	0.0100
31	Shewhart	7.90	22.3	0.0010
32	Shewhart	7.91	22.3	0.3000
33	Shewhart	7.97	22.2	0.5000
34	Shewhart	7.98	22.6	0.0005
35	Shewhart	8.06	23.1	0.1000
36	Shewhart	8.38	24.7	0.0050
37	bt	9.30	8.0	0.0010
38	Ft	9.75	11.9	0.0010
39	EWMA	9.78	5.0	0.0050
40	at	9.85	12.2	0.0010
41	bt	10.31	13.4	0.0005
42	DEWMA	10.58	3.8	0.0500
43	at	10.76	16.6	0.0005
44	Ft	10.79	17.0	0.0005
45	bt	15.80	55.5	0.2000
46	EWMA	26.78	50.5	0.0010
47	EWMA	62.72	94.0	0.0005
48	bt	77.82	119.6	0.3000
49	DEWMA	122.94	124.3	0.0100
50	Ft	147.42	129.3	0.5000
51	bt	184.70	124.5	0.5000
52	DEWMA	207.59	109.4	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-59

Average running length under shift =2.5

	Chart	ARL1	SD	Lambda	shift
1	EWMA	2.36	1.2	0.5000	2.5
2	at	2.38	1.1	0.3000	2.5
3	Ft	2.39	1.2	0.3000	2.5
4	at	2.43	1.5	0.5000	2.5
5	Ft	2.49	1.1	0.2000	2.5
6	at	2.50	1.0	0.2000	2.5
7	EWMA	2.52	1.0	0.3000	2.5
8	DEWMA	2.59	0.9	0.5000	2.5
9	EWMA	2.70	1.0	0.2000	2.5
10	bt	2.80	1.1	0.1000	2.5
11	Ft	2.87	1.1	0.1000	2.5
12	at	2.89	1.1	0.1000	2.5
13	Shewhart	3.20	2.7	0.1000	2.5
14	Shewhart	3.22	2.7	0.0100	2.5
15	EWMA	3.25	1.2	0.1000	2.5
16	Shewhart	3.25	2.7	0.0010	2.5
17	Shewhart	3.27	2.8	0.3000	2.5
18	Shewhart	3.28	2.8	0.5000	2.5
19	Shewhart	3.28	2.8	0.0050	2.5
20	Shewhart	3.29	2.8	0.0500	2.5
21	bt	3.29	12.9	0.2000	2.5
22	Shewhart	3.31	4.7	0.0005	2.5
23	bt	3.32	1.2	0.0500	2.5
24	Shewhart	3.34	2.8	0.2000	2.5
25	DEWMA	3.34	1.0	0.3000	2.5
26	Ft	3.50	1.3	0.0500	2.5
27	at	3.50	1.3	0.0500	2.5
28	EWMA	3.97	1.5	0.0500	2.5
29	DEWMA	4.20	1.3	0.2000	2.5
30	bt	4.91	2.2	0.0100	2.5
31	at	5.25	2.4	0.0100	2.5
32	Ft	5.27	2.4	0.0100	2.5
33	bt	5.82	2.8	0.0050	2.5
34	Ft	6.17	3.2	0.0050	2.5
35	at	6.19	3.2	0.0050	2.5
36	DEWMA	6.21	2.0	0.1000	2.5
37	EWMA	6.29	3.0	0.0100	2.5
38	bt	7.48	4.8	0.0010	2.5
39	Ft	7.63	5.1	0.0010	2.5
40	at	7.68	5.1	0.0010	2.5
41	EWMA	7.87	3.9	0.0050	2.5
42	bt	7.95	5.4	0.0005	2.5
43	Ft	8.06	6.1	0.0005	2.5
44	at	8.06	6.1	0.0005	2.5
45	DEWMA	9.30	3.2	0.0500	2.5
46	EWMA	14.32	13.1	0.0010	2.5
47	EWMA	24.32	40.2	0.0005	2.5
48	bt	25.68	75.1	0.3000	2.5
49	Ft	54.27	99.7	0.5000	2.5
50	DEWMA	84.83	111.2	0.0100	2.5
51	bt	128.55	133.7	0.5000	2.5
52	DEWMA	190.06	117.4	0.0050	2.5
53	DEWMA	270.00	0.0	0.0005	2.5
54	DEWMA	270.00	0.0	0.0010	2.5

Table D4-59

	Chart	ARL1	SD	Lambda
1	EWMA	2.36	1.2	0.5000
2	at	2.37	1.1	0.3000
3	Ft	2.37	1.1	0.3000
4	at	2.46	1.5	0.5000
5	Ft	2.48	1.0	0.2000
6	at	2.48	1.0	0.2000
7	EWMA	2.51	1.0	0.3000
8	DEWMA	2.58	0.9	0.5000
9	EWMA	2.68	1.0	0.2000
10	bt	2.84	1.1	0.1000
11	Ft	2.90	1.1	0.1000
12	at	2.91	1.1	0.1000
13	bt	3.24	12.9	0.2000
14	Shewhart	3.25	2.7	0.2000
15	Shewhart	3.25	2.8	0.0005
16	EWMA	3.27	1.2	0.1000
17	Shewhart	3.27	2.8	0.0050
18	Shewhart	3.27	3.8	0.0010
19	Shewhart	3.27	3.8	0.3000
20	Shewhart	3.28	2.8	0.5000
21	Shewhart	3.30	2.8	0.1000
22	bt	3.30	1.2	0.0500
23	Shewhart	3.30	3.9	0.0100
24	DEWMA	3.34	1.0	0.3000
25	Shewhart	3.35	4.7	0.0500
26	at	3.47	1.3	0.0500
27	Ft	3.47	1.3	0.0500
28	EWMA	3.93	1.5	0.0500
29	DEWMA	4.20	1.2	0.2000
30	bt	4.94	2.1	0.0100
31	at	5.27	2.4	0.0100
32	Ft	5.29	2.4	0.0100
33	bt	5.78	2.8	0.0050
34	Ft	6.13	3.3	0.0050
35	at	6.16	3.3	0.0050
36	DEWMA	6.20	2.0	0.1000
37	EWMA	6.30	2.9	0.0100
38	bt	7.41	4.9	0.0010
39	Ft	7.56	5.2	0.0010
40	at	7.62	5.2	0.0010
41	EWMA	7.81	4.0	0.0050
42	bt	7.91	5.4	0.0005
43	Ft	8.01	6.1	0.0005
44	at	8.02	6.1	0.0005
45	DEWMA	9.21	3.2	0.0500
46	EWMA	14.45	15.0	0.0010
47	bt	24.55	73.4	0.3000
48	EWMA	24.56	41.2	0.0005
49	Ft	54.29	99.7	0.5000
50	DEWMA	84.09	110.7	0.0100
51	bt	129.57	133.7	0.5000
52	DEWMA	188.92	118.0	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010

Table D3-60

Average running length under shift =3

	Chart	ARL1	SD	Lambda	shift
1	at	1.78	0.9	0.5000	3
2	EWMA	1.84	0.8	0.5000	3
3	Ft	1.86	0.8	0.3000	3
4	at	1.88	0.8	0.3000	3
5	Shewhart	2.00	1.4	0.3000	3
6	Shewhart	2.00	1.4	0.1000	3
7	Shewhart	2.00	1.5	0.2000	3
8	Shewhart	2.01	1.5	0.5000	3
9	Shewhart	2.01	1.5	0.0005	3
10	Shewhart	2.01	1.5	0.0500	3
11	Shewhart	2.02	1.5	0.0050	3
12	Shewhart	2.03	1.5	0.0100	3
13	Ft	2.03	0.8	0.2000	3
14	Shewhart	2.04	1.5	0.0010	3
15	bt	2.04	0.9	0.2000	3
16	at	2.04	0.7	0.2000	3
17	EWMA	2.05	0.8	0.3000	3
18	DEWMA	2.17	0.7	0.5000	3
19	EWMA	2.23	0.8	0.2000	3
20	bt	2.33	0.8	0.1000	3
21	Ft	2.41	0.9	0.1000	3
22	at	2.42	0.8	0.1000	3
23	EWMA	2.74	1.0	0.1000	3
24	bt	2.76	1.0	0.0500	3
25	DEWMA	2.90	0.8	0.3000	3
26	Ft	2.92	1.1	0.0500	3
27	at	2.93	1.0	0.0500	3
28	EWMA	3.33	1.2	0.0500	3
29	DEWMA	3.70	1.1	0.2000	3
30	bt	4.15	1.8	0.0100	3
31	at	4.45	2.0	0.0100	3
32	Ft	4.46	2.0	0.0100	3
33	bt	4.84	2.3	0.0050	3
34	Ft	5.15	2.7	0.0050	3
35	at	5.17	2.7	0.0050	3
36	bt	5.19	29.1	0.3000	3
37	EWMA	5.32	2.5	0.0100	3
38	DEWMA	5.55	1.7	0.1000	3
39	bt	6.24	4.0	0.0010	3
40	Ft	6.36	4.3	0.0010	3
41	at	6.41	4.3	0.0010	3
42	EWMA	6.55	3.3	0.0050	3
43	bt	6.72	4.5	0.0005	3
44	at	6.81	4.6	0.0005	3
45	Ft	6.81	4.7	0.0005	3
46	DEWMA	8.35	2.9	0.0500	3
47	EWMA	11.56	5.5	0.0010	3
48	Ft	11.56	41.3	0.5000	3
49	EWMA	15.97	14.0	0.0005	3
50	DEWMA	57.35	91.3	0.0100	3
51	bt	71.17	117.4	0.5000	3
52	DEWMA	169.94	123.3	0.0050	3
53	DEWMA	270.00	0.0	0.0005	3
54	DEWMA	270.00	0.0	0.0010	3

Table D4-60

	Chart	ARL1	SD	Lambda
1	at	1.78	0.9	0.5000
2	EWMA	1.84	0.8	0.5000
3	Ft	1.86	0.8	0.3000
4	at	1.88	0.8	0.3000
5	Shewhart	1.98	1.4	0.0010
6	Shewhart	2.00	1.4	0.1000
7	Shewhart	2.00	1.4	0.3000
8	Shewhart	2.00	1.5	0.5000
9	Shewhart	2.01	1.4	0.0100
10	Shewhart	2.01	1.5	0.0500
11	Shewhart	2.01	1.5	0.0005
12	Ft	2.03	0.8	0.2000
13	Shewhart	2.03	1.5	0.2000
14	Shewhart	2.03	1.5	0.0050
15	at	2.04	0.8	0.2000
16	EWMA	2.05	0.8	0.3000
17	bt	2.08	2.8	0.2000
18	DEWMA	2.17	0.7	0.5000
19	EWMA	2.24	0.8	0.2000
20	bt	2.32	0.8	0.1000
21	Ft	2.40	0.9	0.1000
22	at	2.41	0.9	0.1000
23	EWMA	2.72	1.0	0.1000
24	bt	2.76	1.0	0.0500
25	DEWMA	2.91	0.8	0.3000
26	at	2.92	1.0	0.0500
27	Ft	2.92	1.1	0.0500
28	EWMA	3.32	1.2	0.0500
29	DEWMA	3.68	1.1	0.2000
30	bt	4.15	1.8	0.0100
31	at	4.43	2.0	0.0100
32	Ft	4.44	2.0	0.0100
33	bt	4.84	2.3	0.0050
34	Ft	5.14	2.7	0.0050
35	at	5.15	2.7	0.0050
36	bt	5.22	29.2	0.3000
37	EWMA	5.28	2.4	0.0100
38	DEWMA	5.52	1.7	0.1000
39	bt	6.26	4.1	0.0010
40	Ft	6.39	4.3	0.0010
41	at	6.43	4.3	0.0010
42	EWMA	6.54	3.3	0.0050
43	bt	6.62	4.5	0.0005
44	Ft	6.68	4.7	0.0005
45	at	6.69	4.6	0.0005
46	DEWMA	8.31	2.9	0.0500
47	Ft	11.06	40.2	0.5000
48	EWMA	11.54	4.9	0.0010
49	EWMA	15.72	13.0	0.0005
50	DEWMA	55.24	89.3	0.0100
51	bt	71.08	117.4	0.5000
52	DEWMA	172.36	122.8	0.0050
53	DEWMA	270.00	0.0	0.0005
54	DEWMA	270.00	0.0	0.0010